Universidade do Porto
Faculdade de Psicologia e de Ciências da Educação

PAVING THE WAY FOR BETTER WRITERS

THE ROLE OF SELF-REGULATION IN SHAPING WRITING DEVELOPMENT

Teresa Limpo

Thesis supervised by Professor Rui A. Alves and presented at the University of Porto for the Ph.D. degree in Psychology.

Porto, September 2014

The research presented in this thesis was supported by a doctoral grant from the Portuguese Foundation for Science and Technology (FCT; SFRH/BD/68548/2010) and by the Neurocognition and Language Research Group of the Centre of Psychology of the University of Porto (R&D Unit funded by FCT, 160/50). The studies were carried out within the scope of the DAAR Project – *Development, Automatization, and Self-Regulation of Cognitive Processes in Writing*, also funded by FCT (PTDC/PSI-PCO/110708/2009). Part of the research was conducted under the framework of the COST Action IS0703 – *European Research Network on Learning to Write Effectively*.

RESUMO

Um dos truísmos da abordagem cognitiva à composição escrita é que esta é uma atividade complexa e cognitivamente exigente. Isto é maioritariamente explicado pela profusão de processos envolvidos, cuja gestão eficaz requer níveis elevados de autorregulação. Justamente, o caminho para a proficiência na escrita parece depender do desenvolvimento de competências de autorregulação progressivamente mais sofisticadas. Nesta tese é apresentado um conjunto de quatro estudos cujo objetivo geral foi examinar o papel da autorregulação na escrita em desenvolvimento. O Estudo 1 testou a contribuição da transcrição, planeamento, revisão e autoeficácia para a qualidade da escrita em dois momentos (4º-6º vs. 7º-9º anos). A transcrição contribuiu diretamente para a geração de texto nos alunos mais novos, mas indiretamente, através do planeamento e autoeficácia, nos alunos mais velhos. Este resultado sugere que a progressiva automatização da transcrição pode contribuir para a aquisição e desenvolvimento de competências de autorregulação, fundamentais para produzir textos de qualidade. O Estudo 2 analisou o desenvolvimento do planeamento e revisão, do 4º ao 9º ano, e examinou a contribuição destas competências para a qualidade da escrita nos 4º-6º anos vs. 7º-9º anos, depois de controlar o género, desempenho escolar, idade, fluência manuscrita, ortografia e estrutura textual. Encontrámos um padrão de crescimento na competência dos alunos para planear e rever. Mais ainda, apenas as competências de planeamento e revisão dos alunos mais velhos contribuíram para a qualidade da escrita, para além dos preditores controlo. O Estudo 3 testou a eficácia de dois programas de autorregulação para promover as competências de planeamento e de combinação de frases em alunos do 5º e 6º anos. Os resultados principais foram: (a) ambas as intervenções aumentaram a qualidade e extensão dos textos de opinião; (b) a instrução no planeamento promoveu principalmente a escrita ao nível do discurso; e (c) a instrução na combinação de frases promoveu principalmente a escrita ao nível da frase e da palavra. O Estudo 4 examinou se as teorias implícitas sobre a escrita influenciam a resposta dos alunos a um programa de autorregulação para promover as competências de planeamento no 5º e 6º anos. Depois de termos desenvolvido e testado a escala Teorias Implícitas da Escrita, verificámos que quanto mais os alunos concebiam a escrita como uma competência capaz de ser desenvolvida, mais a qualidade dos seus textos melhorou durante a intervenção. Em conjunto, estes estudos sugerem que a autorregulação é um ingrediente chave para escrever proficientemente e que aumentar o comportamento estratégico dos alunos bem como nutrir crenças pessoais positivas são formas eficazes de promover a competência dos alunos para produzir textos.

RÉSUMÉ

Un des truismes de l'abordage cognitif de la composition écrite est que celle ci est une activité complexe et cognitivement exigeant. Ceci est majoritairement expliqué par la profusion de processus enveloppés dont la gestion efficace requiert des niveaux élevés d'autorégulation. Justement, le chemin pour la compétence dans l'écriture paraît dépendre du développement de capacités d'autorégulation progressivement plus sophistiquées. Dans cette thèse il y est présenté un ensemble de quatre études dont l'objectif général a été examiner le rôle de l'autorégulation dans l'écriture en développement. L'Étude 1 a testé la contribution de la transcription, planification, révision et auto-efficace pour la qualité de l'écriture en deux moments (4º-6º vs. 7º-9º années). La transcription a contribué directement pour la génération du texte dans les élèves plus jeunes, mais indirectement, à travers de la planification et auto-efficace dans les élèves plus âgés. Ce résultat indique que la progressive automatization de la transcription peut contribuer pour l'acquisition et développement de capacités d'autorégulation, fondamentales pour produire des textes avec qualité. L'Étude 2 a analysé le développement de la planification et révision, depuis 4º au 9º année, et si ces capacités ont contribué pour la qualité de l'écriture dans les 4º-6º années vs. 6º-9º années, après contrôler le genre, accomplissement scolaire, âge, fluence manuscrite, orthographie et structure du texte. Nous avons trouvé un patron de croissance en la compétence des élèves pour planifier et revoir. Encore, seulement les capacités de planification et révision dans les élèves plus âgés a contribué pour la qualité de l'écriture. L'Étude 3 a testé l'efficace de deux programmes d'autorégulation pour promouvoir les capacités de planification et combinaison des phrases dans les élèves du 5º et 6º années. Les résultats principales ont été: (a) les deux interventions ont augmenté la qualité et extension des textes d'opinion; (b) l'instruction dans la planification a promu essentiellement l'écriture au niveau du discours; et (c) l'instruction dans la combinaison des phrases a promu essentiellement l'écriture au niveau de la phrase et du mot. L'Étude 4 a examiné si les théories implicites sur l'écriture influencent la réponse des élèves au programme d'autorégulation pour promouvoir les capacités de planification dans les 5º et 6º années. Après avoir développé et testé l'échelle Théories Implicites de l'Écriture, on a vérifié que les élèves qui concevaient l'écriture comme une compétence qui peut être développée on plus augmenté la qualité de leurs textes pendant l'intervention. Ensemble, ces études indiquent que l'autorégulation est un ingrédient critique pour écrire efficacement et que augmenter le comportement stratégique des élèves ainsi que stimuler des croyances personales positives ce sont des formes efficaces pour promouvoir la compétence des élèves pour produire des textes.

ABSTRACT

One of the truisms of the cognitive approach to written composition is that writing is a complex and cognitively demanding activity. This is mostly accounted for the plethora of processes involved in it, whose effective management requires high-levels of self-regulation. Indeed, the road to writing proficiency seems to rely on the development of increasingly sophisticated self-regulation skills. The present thesis reports a set of four studies whose overall goal was to examine the role of self-regulation in beginning and developing writing. Study 1 tested the contribution of transcription, planning, revision, and self-efficacy to writing quality at two developmental points (Grades 4-6 vs. 7-9). Whereas transcription contributed directly to text generation in Grades 4-6, it contributed indirectly via planning and self-efficacy in Grades 7-9. This finding suggests that the progressive automatization of transcription may contribute to the acquisition and development of self-regulation skills fundamental to produce high-quality texts. Study 2 traced the development of planning and revising, from Grade 4 to 9; and examined whether these skills predicted writing quality in Grades 4-6 and 7-9, after controlling for gender, achievement, age, handwriting fluency, spelling, and text structure. We found a growing trend in students' ability to plan and revise. Moreover, only older students' planning and revising skills contributed to writing quality above and beyond control predictors. Study 3 tested the effectiveness of two self-regulation programs aimed at promoting fifth and sixth graders' planning or sentence-combining skills. The following main findings were noteworthy: (a) both interventions increased opinion essay quality and text length; (b) planning instruction mainly enhanced discourse-level writing; (c) sentence-combining instruction mainly enhanced sentence- and word-level writing. Study 4 examined if students' implicit theories of writing influence their response to a self-regulation program to promote planning skills in Grades 5-6. After developing and testing the Implicit Theories of Writing scale with a pilot sample, we found that the more intervention students conceived writing as an incremental skill, the more the quality of their texts improved over instruction. Altogether, these studies suggest that self-regulation is a key ingredient to write proficiently and that increasing students strategic behaviour in writing and nurturing positive self-beliefs are effective ways to boost students' competence in producing texts.

ACKNOWLEDGEMENTS

Although I am authoring this thesis alone, all the efforts I put in it would have been in vain without the support of many people.

The first and foremost is my supervisor, Prof. Rui A. Alves. This thesis is the product of a genuine and vigorous collaboration born and fuelled from a shared interest for writing research. I am deeply grateful for everything you taught me, for all the research opportunities you gave me, and for the unconditional support you always provided me with. Thank you for being such a good mentor, such a good friend.

Prof. São Luís Castro has been an awe-inspiring example to follow and I am extremely thankful for all I learned from her. The high-quality research of Prof. Raquel Fidalgo was an important stimulus for the work presented in this thesis. Additionally, Prof. Ana Isabel Pinto made my wish come true by helping me to go to Vanderbilt University. There, 6500 km far from home, Prof. Dale Farran and her team warmly received me.

This work has strongly benefited from the generous advice of several leading writing researchers: Barbara Arfé, Virginia Berninger, José António Brandão Carvalho, Vince Connelly, Sarah Critten, Julie Dockrell, David Galbraith, Joachim Grabowski, Steve Graham, Olga Gundín, Karen Harris, John Hayes, Malt Joshi, Thierry Olive, Luísa Álvares Pereira, Karen Schriver, and Mark Torrance. This four-year journey was enriched by some colleagues I was lucky to meet: Veerle Baaijen, Elise Drijbooms, Stefan Heβ, Annabele Molyneaux, Saskia Rietdijk, Patricia Robledo, Emma Sumner, and Kirsty Walter. For both the scientific discussions and foolish moments, I am also indebted to the members of the Speech Lab: Marisa Filipe, César Lima, Lénia Carvalhais, Selene Vicente, Paulo Branco, Ana Camacho, Sara Costa, and Céu Teixeira. The rigorous and constructive comments of many reviewers were instrumental in achieving the papers' final versions. A special thanks goes to Pedro Ferreira, always available to share thoughts about the statistical issues rose by them.

The diligence of Dr. Mário Rui, principle of Escola Básica Bento Carqueja in 2011, was crucial to collect the data of Studies 1-2. The support and trustiness of Dr. Laureano Valente, current principle of Agrupamento de Escolas n. 2 de Rio Tinto, was vital to move forward Studies 3-4, along with the tireless efforts of four teachers: Teresa Castro, Helena Nascimento, Sónia Gamboa, and Antónia Gonçalves. In addition, I would like to express my profound appreciation to other inspiring teachers I was fortunate to meet: Fernanda Vasconcelos, Graça Machado, and Assunção Ribeiro. This thesis would not also exist without the committed collaboration and willingness to learn of numerous children. I am greatly honoured to have made a small difference in their lives.

This last paragraph is devoted to my family, who have been anxiously waiting for me to finish the thesis. Well, here it is! I am particularly grateful to those three persons who are a tower of strength to me, both in serene and stormy times. These final words will never truly capture the deep gratitude and sincere love I feel for my mom, dad, and bro. Obrigada people!

LIST OF PAPERS

This thesis is composed of the following four scientific manuscripts published in international peer-reviewed journals:

Limpo, T., & Alves, R. A. (2013). Modeling writing development: Contribution of transcription and self-regulation to Portuguese students' text generation quality. *Journal of Educational Psychology, 105*, 401-413. doi: 10.1037/a0031391 [Study 1]

Limpo, T., Alves, R. A., & Fidalgo, R. (2014). Children's high-level writing skills: Development of planning and revising and their contribution to writing quality. *British Journal of Educational Psychology*, *84*, 177-193. doi:10.1111/bjep.12020 [Study 2]

Limpo, T., & Alves, R. A. (2013). Teaching planning or sentence-combining strategies: Effective SRSD interventions at different levels of written composition. *Contemporary Educational Psychology, 38*, 328-341. doi: 10.1016/j.cedpsych.2013.07.004 [Study 3]

Limpo, T., & Alves, R. A. (2014). Implicit theories of writing and their impact on students' response to a SRSD intervention. *British Journal of Educational Psychology*. Advance online publication. doi:10.1111/bjep.12042 [Study 4]

CONTENTS

LIST OF TABLES

GENERAL INTRODUCTION

STUDY 1

STUDY 2

STUDY 3

STUDY 4

LIST OF FIGURES

GENERAL INTRODUCTION

> Writing itself is mental labor, but finishing an entire book is closer to manual labor. It doesn't involve heavy lifting, running fast, or leaping high. Most people, though, only see the surface reality of writing and think of writers as involved in quiet, intellectual work done in their study. If you have the strength to lift a coffee cup, they figure, you can write a novel. But once you try your hand at it, you soon find that it isn't as peaceful a job as it seems. **The whole process — sitting at your desk, focusing your mind like a laser beam, imagining something out of a blank horizon, creating a story, selecting the right words, one by one, keeping the whole flow of the story on track — requires far more energy, over a long period, than most people ever imagine.** You might not move your body around, but there's grueling, dynamic labor going on inside you. Everybody uses their mind when they think. But a writer puts on an outfit called narrative and thinks with his entire being, and for the novelist that process requires putting into play all your physical reserve, often to the point of overexertion.
>
> Murakami (2009, pp. 81-82)

The value of writing in contemporary nations is irrefutable. Writing is basilar for life-long learning and personal development. It assures full engagement in civic life and facilitates access to high-value jobs. Key engines of economic growth are also dependent upon writing. Still, for this tool to be effective, a certain level of proficiency is needed. The problem is that many children simply do not ever master writing at that level. A likely reason is that writing is too complex (Harris & Graham, 2013). Because of such complexity, researchers do not completely understand it, teachers do not know how to teach it, and students struggle to master it.

The Complexity of Writing

> A writer in the act is a thinker on full-time cognitive overload.
>
> Flower and Hayes (1980, p. 33)

One of the truisms of the cognitive approach to written composition is that writing is a complex and cognitively demanding activity. This is mostly accounted for the plethora of processes involved in it (Bereiter & Scardamalia, 1987; Berninger & Winn, 2006; Chenoweth & Hayes, 2001; Fayol, 1999; Hayes, 1996; Hayes & Flower, 1980; Kellogg, 1996). As a revision to the seminal model proposed in the 1980s (Hayes & Flower, 1980), Hayes (1996) has proposed a comprehensive model of skilled writing that clearly illustrates the complexity of writing (see Figure 1). In this model Hayes has considered two major dimensions: the task environment and the individual.

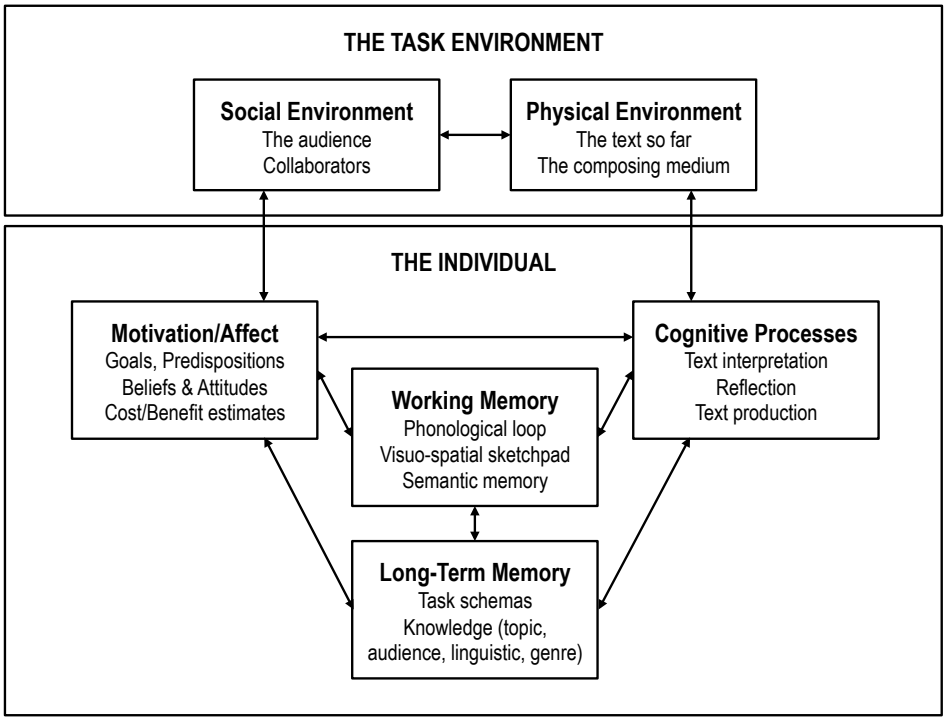


Figure 1. Writing model proposed by Hayes in 1996 (adapted from Hayes, 1996, p. 4) as a revision to the original Hayes-Flower model (Hayes & Flower, 1980). The main differences were the inclusion of the motivation and working memory components as well as the reconceptualization of the cognitive processes.

The task environment dimension is composed by the social and the physical environments. Either by its communicative purpose or by existing in a cultural context, writing is a social activity. Key social players in writing are those to whom the text is written (*audience*). When producing a text, writers are expected to take readers' needs into account and to adapt the text to them (Carvalho, 2002). Another key social players are possible partners with whom the text is fashioned (*collaborators*). Actually, it seems that the collaborative production of texts is very beneficial for students' writing (Graham, McKeown, Kiuhara, & Harris, 2012; Graham & Perin, 2007).

The other component of the task environment concerns the physical factors that influence and interact with text production. One of these factors is the text effectively written (*text so far*), which is usually used by writers as a prompt to write the following piece of text. This type of idea generation was found to be particularly advantageous when it occurs at the final stages of text production (van der Bergh & Rijkaarsdam,

1999). Another physical factor that influence written composition is the particular tool that writers use to produce text (*composing medium*). Both the writing process and product of developing writers was found to depend on whether a pen or a keyboard was used to write (Connelly, Gee, & Walsh, 2007; Hayes & Berninger, 2010).

The individual dimension is composed of a set of four components: motivation/affect, cognitive processes, long-term memory, and working memory. Sustained motivation is a prerequisite to persist in such a challenging task as writing. Under this component Hayes included (a) what writers aim to achieve in a particular writing task (*goals*) and their tendencies for being engaged in those type of tasks over time (*predispositions*); (b) writers' beliefs about themselves as writers and about writing, as well as writers' affective dispositions towards the act of writing (*beliefs and attitudes*); and (c) writers' balance between the effort required by the task and its expected return (*cost-benefit estimates*). Research is accumulating evidence on the involvement of these motivational processes in writing achievement and development (Bruning & Horn, 2000). Self-efficacy, in particular, has proven to be a crucial motivational variable in writing. Writers' confidence in their writing ability consistently predicted writing performance, above and beyond other motivational constructs such as writing apprehension, perceived usefulness of writing, self-efficacy for self-regulation, writing self-concept, and goals (for a review, see Pajares, 2003).

A core component in Hayes's model is the cognitive one. This includes the processes of *reflection*, *text production*, and *text interpretation*. These writing processes are roughly equivalent to those of planning, translating, and revising, originally proposed in the Hayes-Flower model (cf. Hayes & Flower, 1980). Given that these later terms are widely used and accepted within the field, they will be used throughout the thesis. *Planning processes* comprise the formulation of rhetorical goals, which guide the generation and organization of ideas. *Translating processes* involve the transformation of ideas into linguistic forms. *Revising processes* aim to monitor, evaluate, and change the intended and the actual written text. Most current cognitive models of writing largely agree that these cognitive processes support writing (Berninger & Swanson, 1994; Berninger & Winn, 2006; Hayes, 1996; Hayes & Flower, 1980, 1986; Kellogg, 1996). Actually, these processes are so paramount in writing that researchers have been proposing specific models detailing the sub-processes involved in planning (Hayes &

Nash, 1996), translating (Chenoweth & Hayes, 2001), and revising (Butterfield, Hacker, & Albertson, 1996; Flower, Hayes, Carey, Schriver, & Stratman, 1986). A large amount of correlational and intervention studies has also demonstrated that sophisticated planning, fluent translating, and high-quality revising are associated with enhanced writing performance in both child and adult writers (for a review, see Berninger, 2012).

Another essential component in written composition is long-term memory, which stores multiple sources of knowledge that are mobilized during writing. Hayes have identified five types of writing-relevant knowledge, concerning: the procedures specifying how to carry out particular writing activities (*task schemas*), the content of the writing assignment (*topic knowledge*), the characteristics of those to whom the text is addressed (*audience knowledge*), the conventions of language with respect to letter formation, spelling, and grammar (*linguistic knowledge*), and the structure and attributes of different types of texts (*genre knowledge*). It has been shown that writers who are more knowledgeable about the writing topic produce better texts (for a review, see McCutchen, 2011). Likewise, from very early on, a greater knowledge about how to write has been found to be associated with enhanced writing performance (Olinghouse & Graham, 2009).

Writers' affects, cognitions, and memories come into play during the moment-by-moment creation of a text and their coordinated management relies on *working memory*. This cognitive system with storage and processing functions (Baddeley, 1986, 2007) assumes a central position in Hayes's and other influential cognitive models of writing (Berninger & Amtmann, 2003; Berninger et al., 2002; Berninger & Winn, 2006; Chanquoy & Alamargot, 2002; Hayes, 1996; Hayes & Flower, 1980; Kellogg, 1996; McCutchen, 1996, 2011). Empirical studies have been providing substantial evidence on the relationship between writing processes and working memory, in particular, with its central executive component (Vanderberg & Swanson, 2007).

A central problem in writing is that the complexity we have just sketched does not fade with expertise. It is precisely the opposite that seems to happen: Text production gets increasingly complex as writers become more and more proficient (Bereiter & Scardamalia, 1987). Skilled writing is, therefore, characterized by the dynamic and dense articulation of those components proposed by Hayes (1996), whose effective and sustained management requires high-levels of self-regulation.

Self-Regulation in Writing

> Perhaps our most important quality as humans
> is our capability to self-regulate
> Zimmerman (2000, p. 13).

Over the past 30 years, Zimmerman, influenced by the work of Albert Bandura, has made outstanding research into how self-regulation processes operate during learning (for a review, see Zimmerman, 2013). This work allowed Zimmerman to proposed a set of complementary social cognitive models that contributed to understand the role of self-regulation in different academic skills, such as writing. In what follows, we outline the *triadic model* depicting three forms of self-regulation, the *multilevel model* characterizing the sequential development of self-regulation, and the *cyclic phase model* integrating cognitive, metacognitive, and motivational aspects of self-regulation.

Triadic Model of Self-Regulation Processes

Self-regulation is the use of processes, beliefs, and strategies to transform pre-existing mental abilities into academic skills (Zimmerman, 2002). In writing, self-regulation refers to the "self-initiated thoughts, feelings, and actions that writers use to attain various literary goals, including improving their writing skills as well as enhancing the quality of the text they create" (Zimmerman & Risemberg, 1997, p. 76). Writers exert control over the numerous components involved in writing, by using the three forms of self-regulation depicted in Figure 2.

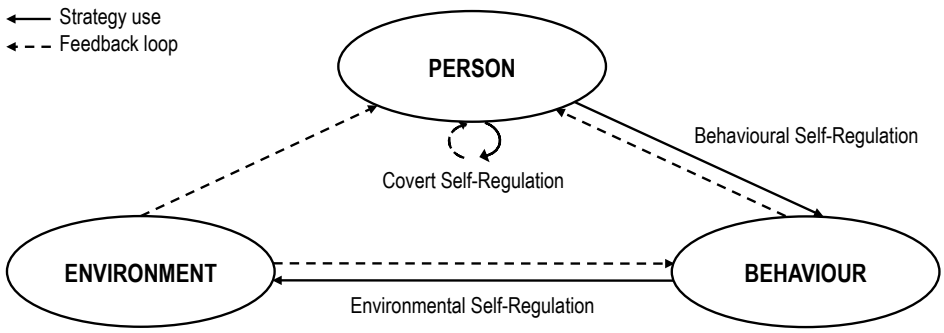


Figure 2. Three forms of self-regulation representing the reciprocal determinants of self-regulated functioning (adapted from Zimmerman, 1989, p. 330).

To remain fully self-regulatory writers need to monitor and strategically adjust the cognitive processes and motivational beliefs associated with writing (*covert or personal self-regulation*), writing-related motoric activities (*behavioral self-regulation*), and the social and physical setting where writing takes place (*environmental self-regulation*). These three forms of self-regulation use three interdependent strategic feedback loops, involving a cyclic process (for a detailed account of the cyclic nature of self-regulation see "Cyclic Model of Self-Regulation Phases" below). To regulate the changing personal, behavioral, and environmental conditions that occur during text production, writers adaptively use a set of self-regulation strategies.

Research has identified several self-regulation strategies that writers employed before, during, or after writing (Graham & Harris, 2000; Zimmerman, 2013; Zimmerman & Risemberg, 1997): goal-setting and planning (i.e., specifying intending outcomes for writing and tactics to achieve goals), time planning and management (i.e., estimate and budget time for writing), organizing and transforming (i.e., rearrangement of materials such as making an outline before writing or modifying text or proposed plans), reviewing records (i.e., reread notes or the text produced so far), mental imagery (i.e., recalling or creating a mental image of a setting, activity, or character before writing), rehearsing and memorizing (i.e., memorize material by overt or covert practice), self-verbalization (i.e., say dialogue aloud while writing about what needs to be done), self-monitoring (i.e., track performance according to goals), self-evaluation (i.e., evaluations of the quality or progress of the text or proposed plans), self-consequences (i.e., attribute rewards or punishments contingent on performance), information seeking (i.e., gather relevant information to the writing topic), seeking social assistance (i.e., solicit help from others), self-selected models (i.e., emulate the writing tactics or style of a more gifted author), and environmental structuring (i.e., select or arrange physical settings).

While producing a text, besides implementing these strategies, self-regulated writers also monitor their effectiveness in achieving writing goals and self-react to the ensuing feedback. They may continue to use successful strategies and they may modify or abandon ineffective ones. The development of such a strategic, self-regulated writing behaviour seems to be largely dependent upon the socialization influences experienced by students during writing instruction.

Multilevel Model of Self-Regulation Development

Schunk and Zimmerman (1997) have proposed that the development of self-regulatory competence occurs in four levels (see Table 1). The first, *observational level* is achieved once students are able to discriminate different qualitative levels in the text production of a model (e.g., teacher). For that, students need to observe the model while producing a text (i.e., modelling) and induce the most appropriate form of doing it. At this level, motivation to learn relies on positive vicarious consequences to the model. The second, *emulation level* is attained when students' composing strategy approaches the one used by the model on a similar writing task. During emulating activities students' accuracy and motivation is enhanced through guidance, feedback, and social reinforcement. The third, *self-controlled level* is reached once students master writing without model's presence, but still in structured settings. Such internalization requires extensive and deliberate writing practice as well as a progressive reduction in the support provided by the model. Students' efforts and success in matching their internal standard will determine self-reinforcement, which is the main motivational source at this level. The final, *self-regulated level* is achieved when students can systematically and effectively adapt their composing strategy to changing personal and contextual conditions (e.g., different genre), with little dependence on the model. Students' can now focus on performance outcomes, which represent the input for strategic adjustments to the composing strategy. Motivation to sustain writing at a self-regulated level depends largely on self-efficacy beliefs.

Table 1
Development of self-regulatory competence (adapted from Zimmerman, 2013, p. 140).

	Features of Regulation			
Levels of Regulation	Sources of Regulation	Sources of Motivation	Task Conditions	Performance Indices
1. Observation	Modeling	Vicarious reinforcement	Presence of models	Discrimination
2. Emulation	Performance and social feedback	Direct/social reinforcement	Correspond to model's	Stylistic duplication
3. Self-control	Representation of process standards	Self-reinforcement	Structured	Automatization
4. Self-regulation	Performance outcomes	Self-efficacy beliefs	Dynamic	Adaptation

Cyclic Model of Self-Regulation Phases

The text production of those writers who achieve a self-regulation level is characterized by the activation of a set of interrelated cognitive, metacognitive, and motivational processes, which are cyclically sustained over the three recursive phases detailed in Figure 3: forethought, performance, and self-reflection (Zimmerman, 2000).

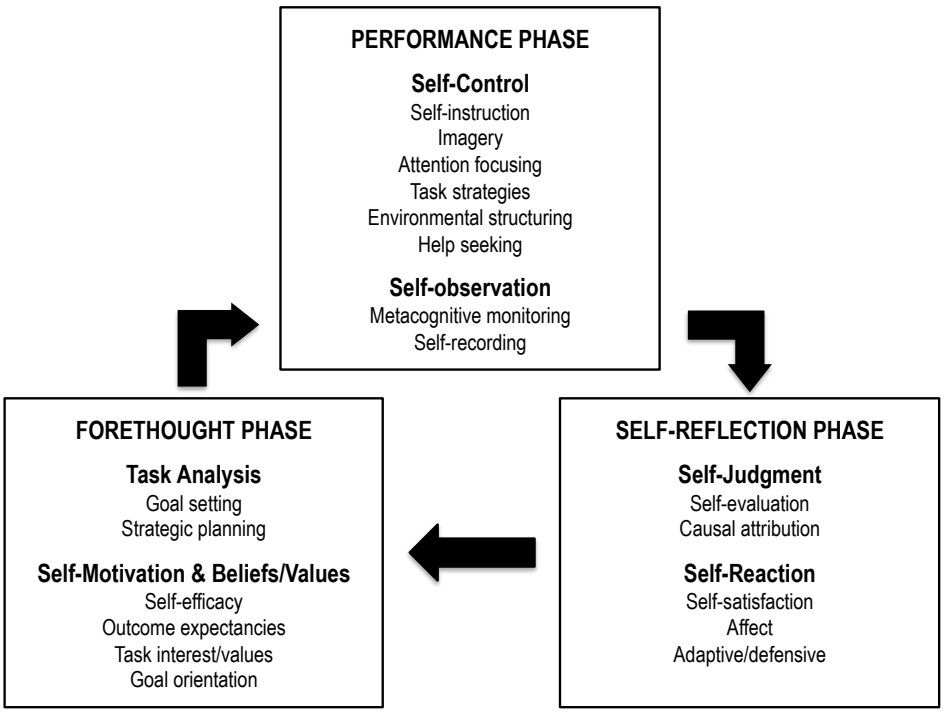


Figure 3. The three phases and respective sub-processes of self-regulation proposed by Zimmerman (2002, p. 67).

The *forethought phase* set the stage for the writing task through the implementation of task analysis strategies such as goal setting and strategic planning (e.g., establishing rhetorical goals and tactics to achieve them), which are supported by the self-motivation beliefs endorsed by writers (viz., self-efficacy, outcome expectancies, task interest/values, and goal orientation). High-quality forethought processes are critical for the selection of appropriate strategies that will guide the writing process during the *performance phase*. Some strategies serve as an aid to

regulate performance, such as saying dialogue aloud about what needs to be done while composing (i.e., self-instructions). Other strategies facilitate observation of one's progress such as counting and keeping a record of the number of spelling mistakes per text (i.e., self-monitoring). In the subsequent *self-reflection* phase, self-judgment processes are used to compare performance against goals and make causal attributions, thus originating satisfaction/dissatisfaction feelings, positive/negative affect, and adaptive/defensive inferences. Closing the cycle, these reactions to one's outcomes influence forethought processes and exert motivational effects that will constrain efforts and performance in future writing tasks.

The extent to which writers engage in these self-sustaining cycles can be seen as a distinctive feature between expert and novice writers. Self-regulated, strategic writers pursue their self-set writing goals through a flexible and knowledgeable employment of general and writing-specific self-regulation strategies, which is guided by adaptive personal beliefs continually fuelled by goals' attainment. This profile is far from being a good portrait of beginning and developing writers (Bereiter & Scardamalia, 1987; Graham, 2006b; Graham & Harris, 2000; McCutchen, 2006). Novice writers barely display such a proactive and systematic use of strategies to regulate cognition, affect, behaviour, and contexts. This poor strategic competence seems to be associated with difficulties in setting goals and action plans to orient writing; limited repertoire of strategies and scant knowledge about their instrumentality; and emerging beliefs about writing and themselves as writers.

Fortunately, there is now a considerable body of evidence showing that, from very early on, the development of self-regulation can be successfully prompted through explicit instruction, thereby resulting in extensive gains in students' writing performance. In particular, strategy-focused interventions seem to be extremely suitable to raise self-regulation because they aim to enhance conscious, goal-directed, and effortful processing in writing through the explicit and systematic teaching of strategies (Pressley & Harris, 2006). One of the most powerful strategy-instruction approaches to boost written composition is the Self-Regulated Strategy Development model developed by Karen Harris and Steve Graham (Graham, 2006a; Graham & Harris, 2003; Harris, Graham, Brindle, & Sandmel, 2009).

Self-Regulated Strategy Development model (SRSD)

Please don't PEE in the classroom — **P**ost, **E**xplain, and **E**xpect
Harris, Graham, Mason, and Friedlander (2008, p. 19)

The development of the SRSD model started in the 1980s, under the premise that students with learning difficulties would benefit from a comprehensive type of instruction, capable of taking into account their cognitive, behavioural, and affective characteristics (for a review, see Graham & Harris, 2009). Accordingly, the main goals of SRSD are to increase students' knowledge about writing and boost proficiency in the high-level cognitive processes involved in writing (e.g., planning and revising), to promote the independent use of self-regulation strategies to monitor and manage students' writing behaviour, and to nurture the development of students' positive attitudes and beliefs about writing and themselves as writers (Harris et al., 2008).

One of the key characteristics of SRSD is that it provides students with explicit and systematic teaching of writing strategies in tandem with self-regulation strategies. The writing strategies contain the procedural or the "how to" knowledge for carrying out writing-specific processes, such as planning, sentence generation, and revising. These strategies include a set of steps whose memorization is promoted through the teaching of mnemonics (e.g., the PLANS strategy tells students that to plan a text they need to: Pick goals, List ways to meet goals, And, make Notes, and Sequence notes; Harris et al., 2008). The self-regulation strategies are critical for regulating writing strategies usage and writing behaviour (Alexander, Graham, & Harris, 1998), by optimizing students' forethought, performance, and self-reflection phases. They promote not only the acquisition of the taught strategies but also their maintenance and generalization. From the previously described self-regulation strategies, those that have been proven to be more crucial for SRSD effectiveness are goal setting, self-monitoring, and self-instructions. Other characteristics pointed out as important in SRSD instruction are: students are treated as active collaborators, who work with the teacher and among them; the role of effort in learning is extremely emphasized; the teacher provides constant feedback and individualized support to students, which is gradually faded, prompting students' responsibility for strategy usage; students proceed at their own pace and do not move to more advanced stages until attaining a set of criteria previously defined (instruction is criterion rather time based).

Typically, the SRSD model encompasses six flexible stages of instruction (for practical examples, see Harris et al., 2008). These stages can be reordered, combined, revisited, modified, or deleted to meet teachers and students' needs.

Stage 1: Develop Background Knowledge

This stage of instruction is aimed at developing the background knowledge and pre-skills required to successfully understand, learn, and implement the writing and self-regulation strategies that are to be mastered. These ley knowledge and skills should be sufficiently developed to enable students to move into the next stages, even though such development is expected to continue throughout instruction, until being completely clear. At this stage, teachers should also help students in identifying and changing negative self-statements (e.g., "I hate writing") that might interfere with subsequent instruction and hinder their performance.

Stage 2: Discuss It

In this stage, teachers and students discuss the strategies to be learned. In particular, their purposes and benefits, how they are employed in writing, and when they can and cannot be used. The steps of the strategies are discussed along with eventual mnemonics supporting its usage. This is also the stage in which teachers may examine students' current performance on the targeted composing skills. Prior texts can be analysed and discussed in a positive, collaborative manner. The point is that students might have not performed very well because they did not know the strategies; but once they know them, their performance will increase. This rationale is important to link performance to strategy use and to emphasize the importance of students' effort in strategy mastery. This stage also favours students' commitment to learn the strategy and act as collaborative partners, which nurtures motivation and fosters learning.

Stage 3: Model It

During this stage, teachers demonstrate how and when to use the target writing and self-regulation strategies, thinking out loud while producing real text. A key part of modelling is, therefore, the use of appropriate self-instructions that orient the writing process. These can include: problem definition ("I need to write a complete opinion

essay with 8 parts"), focusing of attention and planning ("I will start by reading the assignment"), strategy implementation ("To achieve my goal I need to use the strategy my teacher taught me."), self-evaluation ("Did I include all strategy parts?"), coping ("Be calm, I am sure I can remember the strategy."), and self-reinforcement ("I really like this idea!"). Teachers' attitude and language is critical for modelling to be effective. In particular, they should act naturally and enthusiastically, using verbalizations matched to students' verbal style and language. It is also important that teachers model difficulties usually experienced by students, such as forgetting a strategy step or being tired of writing, and how to successfully cope with them (i.e., coping modelling). After modelling, teachers and students analyse and discuss model's performance, with an emphasis on the self-statements employed. Teachers assist students in developing their preferred self-instructions to be used before, during, and after writing, which are then registered to be used throughout instruction.

Stage 4: Memorize It

The memorization of strategies, mnemonics, and self-instructions has already begun as soon as they were introduced in the previous stages. However, in Stage 4 of instruction, teachers need to be sure that students have completely memorized them before moving into the next stage. Additionally, even when memorization is achieved here, teachers need to continue confirming and supporting it in the following stages, either covertly through practice, or overtly through rehearsing. Memorization is particularly important because students will not use a strategy they cannot recall.

Stage 5: Support It

During this stage, students employ the writing and self-regulation strategies previously taught during actual text production. This work is firstly performed collaboratively, with teachers providing students with prompts (e.g., strategy charts, self-instruction sheets, and graphic organizers) and as much support and assistance as needed. Then, while students gradually increase their responsibility in strategy usage, teachers progressively decrease collaboration, prompts, and guidance. At the same time, teachers and students collaboratively establish more and more challenging goals until

final goals are met. Usually, this is the longest stage because students need adequate time to practice the strategies.

Stage 6: Independent Performance

At this last stage of instruction, students are expected to be able to use the strategies autonomously, without the support of teachers and materials. If students are still not self-regulating covertly, fading of overt self-regulation should be encouraged. Procedures to promote maintenance and generalization of the taught strategies are implemented. These may include: delivering booster sessions aimed at reviewing, discussing, and supporting strategy usage; analysing how the taught strategies might be changed to be adequately used across tasks and settings; identifying and providing opportunities to use the strategies in different settings and other appropriate tasks (e.g., assigning specific homework or arrange with other teachers to ask for writing assignments); and discussing the success of such endeavours.

The success of the SRSD model in raising students writing performance has a strong empirical basis. In a meta-analytic review of true- and quasi-experimental studies examining SRSD effectiveness, Harris et al. (2009) (see also Graham, 2006a; Graham & Harris, 2003) reported average effect sizes of 1.20 and 1.23 for writing quality at post-test (n = 15) and maintenance (n = 9), and 1.20 for generalization to untaught genres (n = 5). Besides writing quality, significant and long-term effects of SRSD had also been reported for other aspects of writing, including schematic structure (e.g., inclusion of genre-specific elements), approach to writing (e.g., time spent planning and writing), knowledge about the writing process, and students' self-efficacy beliefs. It is noteworthy that these improvements were observed across achievement level (children with and without difficulties), grade level (from primary to secondary grades), cognitive process taught (both planning and revision), target genre (e.g., stories, opinion essays, comparison-contrast, etc.), group dimension (from individual to classroom instruction), and type of instructor (schoolteacher or researcher).

Studies Goals

Writing is one of the most powerful tools in present-day literate societies. Still, many children struggle to achieve the required proficiency to use it effectively within private and public spheres of society and economy. As argued before, the multitude of processes involved in writing is likely to be the prime reason for this state of affairs. Because of this complexity, which tends to intensify with expertise, writers need to achieve a self-regulated level of writing competence. The development of high levels of self-regulation is essential for effective writing because it allows for the sustained monitoring and strategic adjustment of the personal, behavioural, and environmental processes taking place during writing.

Research has been accumulating evidence on the importance of writers' ability to self-regulate text production to produce high-quality texts. Nonetheless, several questions regarding the role of self-regulation particularly in beginning and developing writing still to be answered: How do self-regulation skills interact with each other and with other writing skills to build writing proficiency? Do self-regulation skills develop throughout schooling? What are the specific effects of self-regulation interventions on the cognitive and motivational writing components? Is the effectiveness of such interventions influenced by writers' self-motivational beliefs? Combining correlational and intervention designs, the present thesis addressed these questions across a set of four empirical studies.

Study 1

Modeling writing development: Contribution of transcription and self-regulation to Portuguese students' text generation quality

This study aimed to analyze the development of writing across schooling, with a focus on the role of transcription and self-regulation, which are critical skills in writing. In particular, we used multiple group structural equation modeling to examine: (a) the relationship between transcription (handwriting and spelling), planning, revision, self-efficacy, and the quality of text generation (story and opinion essay), and (b) if the strength of this relationship changes over time, by comparing it between students in Grades 4-6 (age 9–12, N = 171) and students in Grades 7-9 (age 12–15, N = 205). In

Grades 4–6, the model explained 76% of the variance in writing quality, and transcription contributed directly to text generation. In Grades 7–9, the model explained 82% of the variance in writing quality, and transcription contributed indirectly to text generation, via planning and self-efficacy. Altogether these findings supported our main hypotheses that transcription is the strongest constraint to younger students' text generation, and that transcription automatization contributes to the development of self-regulation skills, which, in turn, positively influence text generation.

Study 2

Children's high-level writing skills: Development of planning and revising and their contribution to writing quality

As reviewed earlier, the activity of producing a text is a complex one involving three main cognitive processes: planning, translating, and revising. Although these processes are crucial in skilled writing, beginning and developing writers seem to struggle with them, mainly, with planning and revising. In this study, we aimed to trace the development of the high-level writing processes of planning and revising, from Grade 4 to 9; and to examine whether these skills predict writing quality in younger and older students (Grades 4-6 vs. 7-9), after controlling for non-writing variables (viz., gender, school achievement, age) as well as writing variables (viz., handwriting fluency, spelling, and text structure). Participants were 381 students from Grade 4 to 9 (age 9 to 15) and they were asked to plan and write a story, and to revise another story by detecting and correcting mechanical and substantive errors. From Grade 4 to 9, we found an overall increase in students' ability to plan and revise. Moreover, whereas younger students' planning and revising skills made no contribution to the quality of their writing, in older students, these high-level skills contributed to writing quality above and beyond control predictors. The findings of the present study seem to indicate that, besides the increase of planning and revising, these skills are not fully operational in school age children, signalling the need for supplementary explicit instruction and extensive practice from very early on.

Study 3

Teaching planning or sentence-combining strategies: Effective SRSD interventions at different levels of written composition

This study tested the effectiveness of two strategy-focused interventions aimed at promoting fifth and sixth graders' opinion essay writing. Over 12 weekly 90-min lessons, well-trained teachers implemented one of two programs, which followed the SRSD model previously described. Both programs taught a writing strategy in combination with self-regulation procedures (viz., goal-setting, self-monitoring, self-reinforcement, and self- instructions). While one of the programs taught a strategy for planning opinion essays (N = 48), the other one taught a strategy for combining sentences in opinion essay writing (N = 39). These intervention groups were compared with a practice control group (N = 39) receiving standard writing instruction. Students were evaluated before, in the middle of, and after instruction on a comprehensive set of writing measures, including strategy-specific skills, writing performance, levels of writing, motivation, and generalization. The following main findings were noteworthy: (a) planning and sentence-combining instruction enhanced planning and sentence-construction skills, respectively; (b) both interventions increased opinion essay quality and text length; (c) planning instruction enhanced not only discourse-level writing but also some sentence- and word-level aspects of composition; (d) sentence-combining instruction enhanced not only sentence- and word-level writing but also some discourse-level aspects of composition; (e) after instruction, there was a correlation between self-efficacy and writing quality in both intervention groups; and (f) planning, but not sentence-combining, instructional effects generalized to summary writing. This study corroborated that the use of the SRSD model to teach key writing processes, such as planning and translation, is an effective way to foster students' writing performance.

Study 4

Implicit theories of writing and their impact on students' response to a SRSD intervention

Notwithstanding that SRSD has been consistently found to increase students' writing performance, few studies have focused on the self-beliefs that may either facilitate or hinder this growth. This was the main purpose of Study 4, which focused on implicit theories of writing. Implicit theories have been mainly studied in the field of

intelligence, in which individuals were found to conceive intelligence as a fixed trait that cannot be changed (entity beliefs), or as an incremental trait that can be developed (incremental beliefs). What about writing? Do people hold similar implicit theories about the nature of their writing ability? Furthermore, are these beliefs likely to influence students' response to a writing intervention? To answer these questions we first developed the Implicit Theories of Writing (ITW) scale that was tested with a pilot sample of 128 students in Grades 5-6. Afterwards, we conducted an intervention study to examine if these beliefs influence strategy-instruction effectiveness. For that, 109 students received the planning SRSD intervention developed in the previous study were compared with 83 students receiving standard writing instruction. Students were evaluated before, in the middle of, and after instruction. ITW's validity was supported by piloting results and their successful cross-validation in the intervention study. In this, intervention students wrote longer and better texts than control students. Moreover, latent growth curve modelling showed that, as predicted, the more intervention students conceived writing as a malleable skill, the more the quality of their texts improved. These results were of educational relevance by confirming that students' self-beliefs represent powerful influences in shaping their response to intervention.

STUDY 1

MODELING WRITING DEVELOPMENT

CONTRIBUTION OF TRANSCRIPTION AND SELF-REGULATION TO PORTUGUESE STUDENTS' TEXT GENERATION QUALITY

Published manuscript:
Limpo, T., & Alves, R. A. (2013). Modeling writing development: Contribution of transcription and self-regulation to Portuguese students' text generation quality. *Journal of Educational Psychology, 105*, 401-413. doi: 10.1037/a0031391

From a cognitive perspective, writing is a complex and costly skill that places multiple demands on the writer (Hayes, 1996). Writing is such a complex and demanding activity that it generally takes more than two decades to achieve writing expertise (Kellogg, 2008). Berninger and colleagues have argued that both the simple view of writing proposed by Juel, Griffith, and Gough (1986; Juel, 1988), and the not-so-simple view of writing (Berninger & Winn, 2006; see also Berninger & Chanquoy, 2012) contribute to better understand the writing processes and how they may change over development. In the not-so-simple model, text generation is supported by the collaboration between transcription (handwriting and spelling) and high-level cognitive skills for self-regulation, such as planning and revising. During writing, the interaction among these processes occurs within working memory constraints. In a notable review, Graham and Harris (2000) also concluded that writing development depends on the automatization of transcription and the acquisition of high levels of self-regulation.

The present study aims to contribute to extant research on writing development by focusing on the role of transcription and self-regulation skills in writing. Although considerable research has shown that these skills influence writing quality, little is known about their relative contribution to text generation throughout schooling. Moreover, studies have been yielding contradictory findings regarding the relationships between transcription and self-regulation and their contribution to written composition from a developmental perspective. The current study was therefore designed to examine the relationships among transcription, self-regulation, and text generation, and to directly compare them at two developmental points (Grades 4-6: age 9-12 vs. Grades 7-9: age 12-15, with about 60 children per grade level). To our knowledge, no such large and comprehensive assessment study, using multiple-group structural equation modeling, has investigated the joint development of these critical writing skills across six years of schooling.

Transcription Predicts Writing Quality

Transcription refers to the transformation of language representations in working memory into written text (Berninger, 1999; Graham, Berninger, Abbott, Abbott, & Whitaker, 1997). This requires the retrieval of orthographic symbols and the execution of fine-motor movements for producing them (Abbott & Berninger, 1993). Thus, transcription involves spelling and handwriting.

This low-level writing skill was under-recognized for years (Medwell & Wray, 2008) because it was assumed that it did not interfere with text quality in typically developing children beyond primary grades (Scardamalia, Bereiter, & Goleman, 1982). Nevertheless, during the last two decades, writing research has been accumulating evidence about the impact of transcription in the quality of texts produced by children and adolescents, with and without disabilities (Connelly et al., 2007; De La Paz & Graham, 1995; Graham, 1990; MacArthur & Graham, 1987; Reece & Cumming, 1996). Graham et al. (1997; see also Graham & Harris, 2000) reviewed several correlational studies and concluded that transcription was moderately correlated with text quality. However, this finding should be read carefully as, in the majority of these studies, spelling and handwriting bias were not removed from text quality scoring. This is problematic because it was observed that poor spelling and penmanship have a negative impact on holistic assessments of text quality (Berninger & Swanson, 1994). In the studies reviewed next, this methodological limitation was address by setting apart transcription skills from quality assessments.

Regarding spelling, Juel (1988) found that, in Grade 1, 29% of the variance in writing quality was explained by spelling skills, but in Grade 4 the explained variance dropped to 10%. In a 5-year longitudinal study (Grades 1-7), Abbott, Berninger, and Fayol (2010) found that spelling was the most consistent predictor of composing across adjacent grades ($.25 < \beta < .67$). Using structural equation modeling with multiple measures of each construct, Graham et al. (1997) showed that handwriting fluency contributed to writing quality in Grades 1-3 ($\beta = .53$) as much as in Grades 4-6 ($\beta = .67$). Alves and Jesus (2011) found significant correlations between handwriting fluency and writing quality in Grade 2 ($r = .36$), but not in Grades 1, 3, and 4. Christensen (2004) found moderate correlations with a sample of older students (Grades 8-9; $r = .44$). Generally, these studies have shown that writing quality is influenced by writers'

transcription skills, even though results are mixed concerning the developmental pattern of this relationship. This might be due in part to whether single or multiple measures were used to assess handwriting fluency, spelling, and compositional quality, and also to whether cross-sectional or longitudinal research designs were used.

Berninger and colleagues conducted a comprehensive cross-sectional study collecting multiple transcription and text generation measures from Grade 1 to 9 (for reviews see Berninger & Swanson, 1994; Berninger, 1999). They found that in Grades 1-3 (age 6-9) and Grades 4-6 (age 9-12), respectively, 25% and 42% of the variance in compositional quality was explained by transcription (see also Graham et al., 1997). It is noteworthy that the explained variance in writing quality by transcription dropped to 18% in Grades 7-9 (age 12-15). Although this decrease was not statistically tested, it was suggested that students became more proficient in transcription and these processes may have exerted less constrain on text generation (Berninger, 1999).

Self-Regulation Predicts Writing Quality

Self-regulation is critical in writing as it enables writers to attain their literary goals through the use of strategies employed before, during, and after writing (Zeidner, Boekaerts, & Pintrich, 2000). Zimmerman and Risemberg (1997) proposed three kinds of self-regulatory strategies involved in the deliberate management of the composing process: (a) environmental strategies entail the self-regulation of the physical or social setting where writing takes place; (b) behavioral strategies comprise writing-related motoric activities, and (c) personal strategies encompass cognitive and affective processes that writers use to increase their effectiveness. Two of the most important cognitive self-regulatory strategies for organizing, producing, and transforming written text are planning and revising (Graham & Harris, 2000; Harris, Santangelo, & Graham, 2010; Zimmerman & Risemberg, 1997).

Planning involves setting goals, generating, and organizing ideas (Hayes & Flower, 1980). As it can occur before or during writing, a distinction was made between advanced and online planning (Berninger & Swanson, 1994). Several correlational studies have analysed how students' ability to generate a plan before writing is related to their writing performance. In the studies reviewed below, preplanning skills were assessed through the complexity of students' written plans. Generally, outlines and

graphic organizers are considered as the most sophisticated form of preplanning (see Hayes & Nash, 1996 for a review on planning measures).

In Grades 2 and 4, it was found that students' plans did not predict writing quality (Olinghouse & Graham, 2009). Likewise, in Grades 4-6, preplanning skills were not related to compositional quality (Whitaker, Berninger, Johnston, & Swanson, 1994). Only in Grades 7-9, positive but weak correlations were found between preplanning and writing quality ($r > .17$; Berninger, Whitaker, Feng, Swanson, & Abbott, 1996). As younger students' written plans were very similar to their texts, it was suggested that they were not differentiating planning from translating (Bereiter & Scardamalia, 1987; Berninger & Swanson, 1994; McCutchen, 2006). Moreover, it was found that only 15% of sixth graders engaged in outlining before writing (Torrance, Fidalgo, & García, 2007). This value increased to 33% in a similar study with eight graders (Fidalgo, Torrance, & García, 2008).

Concerning revision, there is general agreement that at least it includes two key-processes: problem detection, which includes schema-guided reading and text evaluation, and problem correction, which involves the selection of a revising strategy and its implementation (Chanquoy, 2009; Fitzgerald, 1987). Whether the revising strategy operates at the surface or meaning level, it can be classified as editing or rewriting (Allal, Chanquoy, & Largy, 2004). In a similar way to preplanning, revision is hardly included in the composition process of novice writers (Fitzgerald & Markham, 1987; McCutchen, 2006). Although ability to revise emerged in Grades 4-6 in a sample studied by Whitaker et al. (1994), it only operated at all levels of language (i.e., word, sentence, and text) in Grades 7-9 (Berninger et al., 1996). Young writers' revisions seem also to have a very limited impact on text quality (Graham, Harris, MacArthur, & Schwartz, 1991) – probably because younger students tended to focus their revisions on surface problems, whereas older writers focused on meaning problems (Graham et al., 1993; Harris et al., 2010; MacArthur & Graham, 1987).

Intervention studies have provided strong support for the association between planning and revision with writing quality. Meta-analyses have shown that students from Grades 2 to 12 wrote better texts after receiving instruction in planning and/or revision (Graham et al., 2012; Graham & Perin, 2007). Importantly, writing quality increased when these strategies were taught in tandem with other self-regulatory

strategies (Brunstein & Glaser, 2011; Glaser & Brunstein, 2007; for a review see Harris & Graham, 2009). Examining the underlying mechanisms of a successful self-regulation-based intervention, Brunstein and Glaser (2011) found that it had a positive impact on text quality by promoting planning and revising. Of great import, they showed that the intervention was associated with an increase in students' writing knowledge and self-efficacy.

Writers' beliefs about their writing ability are a main component of self-regulation (Zimmerman, 1995). Self-efficacy depends on the effectiveness of the self-regulatory strategies employed and influences their persistent use in writing (Zimmerman & Risemberg, 1997). For instance, if writers attain their goals by planning or revising, their self-efficacy increases and they continue using these strategies (Schunk & Ertmer, 2000). Consequently, writing performance is enhanced (for reviews see Klassen, 2002a; Pajares, 2003). Indeed, at different school levels, self-efficacy predicted writing quality above and beyond previous performance (effect sizes ranged from .19 to .40; Pajares, Miller, & Johnson, 1999; Pajares & Valiante, 1997, 1999). Analyzing the development of writing self-efficacy Pajares, Valiante, and Cheong (2007) found a decrease from Grade 4 to 8. Despite the expectation that an increase in competence across schooling would be accompanied by an increase in self-efficacy, this pattern was not verified. Possibly, younger students may overestimate their writing skills, as some students with learning disabilities tend to do (Klassen, 2002a, 2002b).

Transcription Competes with Self-Regulation

Low-level transcription and high-level self-regulation processes impose heavy demands on the limited capacity of working memory. Vanderberg and Swanson (2007) showed that the central executive significantly predicted planning, translating, and revising, as well as vocabulary, punctuation, text structure, and grammar (beta weights ranged from .21 to .32). As transcription and self-regulation compete for the same pool of attentional resources, these processes must be juggled to manage cognitive load (Alamargot, Plane, Lambert, & Chesnet, 2010; Berninger, 1999; Fayol, 1999; Kellogg, 1996; McCutchen, 1996).

Beginning writers, who adopt the so-called knowledge telling strategy for composing, do not show this coordination (Bereiter & Scardamalia, 1987). Bourdin and

Fayol (1994, 2000) showed that as transcription is a large resource drain, it constrains the acquisition and use of high-level writing skills (see also Alves, Branco, Castro, & Olive, 2012; Grabowski, 2010; Olive & Kellogg, 2002). This may explain, first, why young writers' barely plan or revise spontaneously and, second, why their planning and revising skills are not sufficiently developed to influence text production. However, in the course of the school years, transcription becomes more efficient, reducing the cognitive effort required (Kellogg, 2008; McCutchen, 1988; Olive, Favart, Beauvais, & Beauvais, 2009). In line with a capacity theory of writing, this gradual automatization enables writers to use their spare attentional resources for high-level processes (Fayol, 1999; McCutchen, 1996). This shift of cognitive resources allocation may set the basis for the more elaborated composing strategy of knowledge-transforming (Bereiter & Scardamalia, 1987). Transcription stops being a major source of constraint, leading to the development and successful employment of planning and revising strategies in writing.

Regarding writing self-efficacy, little is known about how it is influenced by transcription processes, which are crucial in developing writing. Given that young writers consider writing transcription features as the most important ingredients in good writing (Graham, Schwartz, & MacArthur, 1993; Lin, Monroe, & Troia, 2007; Olinghouse & Graham, 2009), it seems likely that they may use observable information, such as the length of their texts or the number of spelling errors, to appraise their writing ability. Indeed, one of the most influential sources of self-efficacy is students' interpretation of their own performances (Bandura, 1997).

Overview of the Current Study

Multiple-group structural equation modeling was used to examine the development of writing throughout school years. In particular, we aimed to analyze: (a) the relationship between transcription (handwriting and spelling), planning, revision, self-efficacy, and the quality of text generation (story and opinion essay), and (b) if the strength of this relationship changes over time. For that, we tested the model depicted in Figure 1 at Grades 4-6 (age 9-12) and 7-9 (age 12-15). Although the proposed paths were based on the multiple sources of evidence reviewed above, to the best of our knowledge, no such model was previously tested across development.

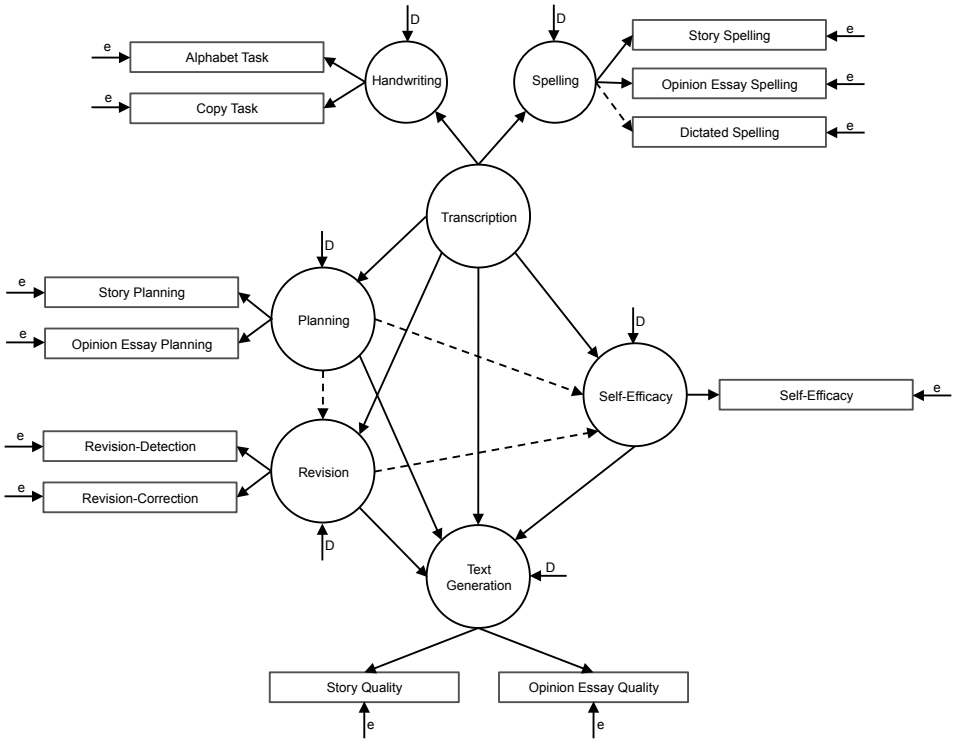


Figure 1. Structural model of the relationship between transcription, planning, revision, self-efficacy, and text generation. Circles represent factors (i.e., latent variables), rectangles represent indicators (i.e., observed variables), and arrows represent direct paths (dashed lines represent paths that were removed from the final model). e = measurement error; D = structural error.

In Grades 4-6 we predicted a direct effect of transcription on text generation quality, but in Grades 7-9 we predicted an indirect effect of transcription on text generation via planning and revision. As younger students have not mastered transcription yet, text generation was expected to be largely constrained by it (Graham et al., 1997). A different pattern was expected in older students when transcription becomes automatized and should exert less constraint on text generation (Berninger, 1999; Berninger & Swanson, 1994; Kellogg, 2008). This increased transcription fluency may enable them to develop their planning and revising abilities (Bereiter & Scardamalia, 1987; Fayol, 1999; McCutchen, 1996), which in turn may influence writing quality (Graham & Harris, 2000). As in Grades 7-9 (Berninger et al., 1996), but not in Grades 4-6 (Whitaker et al., 1994), planning and revising were found to be correlated, albeit weakly (*r*s = .25), we expected a stronger effect from planning to revision in older than younger writers.

The hypotheses regarding the paths from transcription, planning, and revising to self-efficacy were as follows. In Grades 4-6, we predicted that self-efficacy would be influenced by transcription. This prediction stems not only from the critical role that transcription has on younger students' writing (Berninger, 1999) but also from their emphasis on production factors when defining good writing (Olinghouse & Graham, 2009). In Grades 7-9, we predicted that self-efficacy would be influenced by planning and revising because self-efficacy depends on the effectiveness of the self-regulatory strategies (Zimmerman & Risemberg, 1997). Older students not only use them successfully (Berninger et al., 1996) but also acknowledge their importance in writing (Graham et al., 1993). Finally, we hypothesized that self-efficacy would influence text generation at both grade levels. Research findings have shown that self-efficacy predicts writing performance throughout schooling (Pajares, 2003).

Method

Participants

Participants were 419 Portuguese native speakers in Grades 4-9. Forty three students were excluded from the analyses based on one or more of the following criteria: absence in one of the two administration sessions (17 students), task instructions not followed (22 students), special education needs (five students), and incomplete tasks (six students). Subsequent analyses were based on the data from 376 students.

Younger sample. This sample included 171 students in Grades 4-6 (57 fourth graders, M_{age} = 10.0 years, SD = 0.3, age range = 9.4–11.0; 49 fifth graders, M_{age} = 11.0 years, SD = 0.6, age range = 10.4–13.0; 65 sixth graders, M_{age} = 12.1 years, SD = 0.5, age range = 11.4–14.0; for the all sample: M_{age} = 11.1 years, SD = 1.0; 92 girls and 79 boys). Students' socioeconomic status was assessed through the educational level of their parents. Respectively, mother and father's educational level was as follows: 18% and 23% completed Grade 4 or less; 45% and 53% completed Grade 9 or less; 19% and 13% completed high school; 16% and 7% completed college or college plus some postgraduate study; and 2% and 4% was unknown. In 2011, Portuguese national statistics regarding females and males' educational level is as follows: 24% and 27%

completed Grade 4 or less; 30% and 38% completed Grade 9 or less; 17% and 17% completed high school; 15% and 11% completed college or college plus some postgraduate study, and 14% and 7% was unknown (Fundação Francisco Manuel dos Santos, 2012). Student's achievement was assessed via their previous marks for Portuguese, Mathematics and History. Their marks are given in a scale ranging from 1 (lowest score) to 5 (highest score). Taken all subjects together, 14% to 19% had marks below 3; 36% to 46% had marks equal 3; and 35% to 50% had marks above 3.

Older sample. This sample included 205 students in Grades 7-9 (69 seventh graders, M_{age} = 13.0 years, SD = 0.4, age range = 11.9–14.4; 61 eighth graders, M_{age} = 13.9 years, SD = 0.4, age range = 12.7–15.3; 75 ninth graders, M_{age} = 15.0 years, SD = 0.5, age range = 14.4–16.8; for the all sample: M_{age} = 14.0 years, SD = 0.9; 97 girls and 108 boys). Respectively, mother and father's educational level was as follows: 13% and 14% completed Grade 4 or less; 45% and 48% completed Grade 9 or less; 20% and 17% completed high school; 20% and 17% completed college or college plus some postgraduate study; and 2% and 4% was unknown. Regarding students' achievement, taken Portuguese, Mathematics and History together, 8% to 26% had marks below 3; 49% to 53% had marks equal 3; and 25% to 39% had marks above 3.

Setting

Students came from 19 classes integrated in a public cluster of schools located in an urban district in Northwest Portugal. In Portugal, Basic Education lasts 9 years and comprises three stages: Grades 1-4 (age 6-10), Grades 5-6 (age 10-12), and Grades 7-9 (age 12-15). Stage 1 is provided in primary schools and only one teacher is responsible for teaching four main courses; Stage 2 is provided in basic schools and children have one teacher for each of the nine courses; finally, Stage 3 is provided in basic or secondary schools and students have eleven courses taught by different teachers.

Regarding the teaching of writing in Portugal, two key shifts occurred in the past two decades (Álvares Pereira, Aleixo, Cardoso, & Graça, 2010). First, writing was assumed as a specific teaching object since its importance in students and professionals' lives was recognized. Second, there was a shift from a product to a process approach to writing, which provides explicit teaching on how planning, translating, and revising

processes can be carried out in text production. Although writing is the preferred learning and assessment tool across courses and schooling, explicit writing instruction only occurs in Portuguese Language classes.

Handwriting Fluency Measures

Alphabet task. Students were asked to write the alphabet in lowercase as quickly as possible without making mistakes (Berninger et al., 1992). The experimenter told them to stop 15 s after they had started writing the alphabet. The final score was the number of correct letters written. A letter was counted when it was legible out-of-context and in the right alphabetical order.

Copy task. Students were asked to copy a 60-word paragraph as quickly as possible without making mistakes. After 90 s copying it, the experimenter told them to stop. The final score was the number of words copied accurately. A word was considered correct when its letters and diacritics were clearly copied without any mistake.

Spelling Measures

Spontaneous spelling. A measure of spelling in a functional communicative context was provided by the percentage of words spelled correctly in the story and in the opinion essay.

Dictated spelling. Forty words were dictated at intervals of 6 s. These words belong to five categories representing some complexities of the Portuguese spelling system: silent letter *h*, contextual effect, position effect, inconsistency, and consonantal group (for greater detail see Carvalhais & Castro, 2014). The final score was the total number of words spelled correctly.

Planning Measures

The experimenter gave students a green sheet and explained to them that before writing the text they would have 3 min to plan it. They were told to use that sheet as their "think pad" and to write down everything that could help them to write the text (for a similar procedure see Berninger et al., 1996). The developmental maturity of students' planning behavior was measured with a scale ranging from 1 (*low*) to 6 (*high*).

The scores 1 and 2 were attributed to plans that represent no preplanning and minimal preplanning, respectively. Plans summarizing the text received a score of 3, and plans with topics slightly elaborated in the text received a score of 4. The scores 5 and 6 were attributed to plans with emergent subordination (i.e., rudimentary macrostructure) and structural relationships (e.g., graphic organizers), respectively. This scoring scale is non-genre dependent and was based on the scales developed by Whitaker et al. (1994), and Olinghouse and Graham (2009). Participants made one plan for the story and another for the opinion essay and both measures were considered.

Revision Measures

To measure students' revising skills, they were asked to revise a narrative text, which had two meaning errors of three kinds created by missing, inconsistent, and out-of-sequence sentences. As younger students seem to have problems in detecting errors (Beal, 1990), which is necessary for their correction, the task was performed in two phases. First, students were asked to mark "anything that it is not right or does not sound good". Second, the experimenter gave them the same text with the target errors marked and asked students to correct them. Respectively, the final scores were the total number of errors accurately detected (revision-detection) and corrected (revision-correction).

Self-Efficacy Measure

To measure self-efficacy beliefs, students filled out the Writing Skills Self-Efficacy scale (Pajares & Valiante, 1999) that we adapted to the Portuguese language. The scale has 10 items, which measure students' confidence about being able to accomplish specific writing skills (e.g., *Correctly spell all words in a one-page story or composition*). The answers were given in a scale ranging from 0 (*no chance*) to 100 (*completely certain*). As suggested by Pajares (2003), the self-efficacy assessment must be matched to and in close temporal proximity with the writing outcome. Accordingly, after the text topic was presented, students were asked to judge their confidence in accomplishing those skills when writing about that topic. Thus, two measures of self-efficacy were collected: story self-efficacy ($\alpha_{4\text{-}6} = .93$; $\alpha_{7\text{-}9} = .94$) and opinion essay self-efficacy ($\alpha_{4\text{-}6} = .94$; $\alpha_{7\text{-}9} = .94$). Because multicollinearity between these two measures

($r_{4\text{-}6}$ = .81; $r_{7\text{-}9}$ = .87) could create estimation and inference problems, as suggested by Kline (2005), they were averaged to form a composite score (viz., self-efficacy).

Text Generation Measures

Text generation was assessed through the quality of a story (Tell a story about a child who lost his/her pet) and an opinion essay (Do you think teachers should give students homework every day?). To control for potential effects of genre difficulty on subsequent tasks, writing order for genre was counterbalanced. Students had 8 min to write the text and they were notified 4 and 2 min before the end of the time limit. Anytime a student stopped writing he/she was prompted once to continue.

Four graduate students, blind to study purposes, rated the overall text quality using a scale ranging from 1 (*low quality*) to 7 (*high quality*). To control for expected differences between grade levels, one pair of judges rated the texts from Grades 4-6, and the other pair rated the texts from Grades 7-9. Raters were told to consider and give the same weight to the following factors: ideas quality (i.e., originality and relevance of the ideas), organization (i.e., coherence and organization of the text), sentence structure (i.e., syntactic correctness and diversity of the sentences), and vocabulary (i.e., diversity, interest, and proper use of the words). To avoid biased judgments all texts were previously typed and corrected for spelling, punctuation, and capitalization errors. For each text genre, the scores were the average for the two judges.

Measures Reliability

At each grade level, a second judge rescored the written products for 20% of the students. For the alphabet and copy task, story and opinion essay spelling, dictated spelling, story and opinion essay planning, and error detection and correction tasks, inter-rater reliability (Pearson's coefficient) was .98, 1.00, .99, .99, 1.00, .89, .89, 1.00 and 1.00, respectively. For story and opinion essay quality evaluation, inter-rater reliability was, respectively, .79 and .84 for Grades 4-6, and .85 and .83 for Grades 7-9.

Procedure

Classroom groups with 20-25 students performed the tasks that were distributed between two 45-min sessions during the month of May (end of Portuguese academic

year). Both sessions started with the presentation of the text topics. Then, students filled out the self-efficacy scale about the presented genre. After that, they planned and wrote the text. Lastly, students performed the spelling and revision tasks in the first session, and the copy and alphabet tasks in the second one. Two adults were always present in the room to guarantee that experimental procedures were carried out as intended.

Results

Preliminary Data Analysis

Descriptive statistics for the observed variables for Grades 4-6 and 7-9 are displayed in Table 1. The inspection of the skewness and kurtosis of all variables revealed no distributional problems, as the absolute values of these indexes did not exceed 3.0 and 10.0, respectively (Kline, 2005). Table 2 presents the intercorrelations among all study variables by grade group. Generally, correlations were positive and modest in size, with a similar pattern for both samples.

Structural Equation Modeling

Figure 1 depicts the model that was tested against data from two groups: Grades 4-6 vs. Grades 7-9. Multiple-group structural equation modeling was used to evaluate model invariance across both groups. To test the hypotheses that the relationships among latent constructs were different across samples, data analyses encompassed a series of hierarchical steps (Byrne, 2010; Kline, 2005). First, we tested if the model fit the data of both grade groups, separately. For that, single-group analyses were conducted to establish a baseline model for each group (baseline model). Second, we tested if this model fit the data of the two groups, simultaneously. For that, the parameters estimated in the baseline model were estimated in a multiple-group model, with no restrictions on its parameters (configural model). Third, we tested if the path coefficients between latent variables and indicators were equivalent. For that, factor loadings were constrained to be equal across groups (measurement model). Fourth, we examined whether factor structure was consistent across grade groups. To test structural invariance, equality constrains on structural paths were introduced in a stepwise fashion (structural model).

Table 1

Descriptive statistics for all measures by grade group.

Measure	Grades 4-6 (*n* = 171)				Grades 7-9 (*n* = 205)			
	M	*SD*	*Sk*	*Ku*	*M*	*SD*	*Sk*	*Ku*
Alphabet task	14.69	5.10	0.62	0.27	20.93	5.43	-0.02	0.49
Copy task	29.99	5.60	-0.16	-0.11	40.16	5.88	-0.39	0.44
Story spelling	95.71	4.18	-1.81	4.13	98.03	2.13	-1.70	3.39
Opinion essay spelling	95.11	4.98	-2.41	8.40	97.87	2.56	-2.43	8.19
Dictated spelling	30.71	4.44	-1.02	1.05	35.16	2.84	-1.36	2.59
Story planning	2.38	1.28	0.23	-1.64	3.10	1.39	-0.22	-1.01
Opinion essay planning	1.92	1.14	1.03	-0.25	3.06	1.39	-0.17	-1.35
Revision-detection	1.07	1.03	0.64	0.04	1.55	1.23	0.67	0.20
Revision-correction	1.32	0.94	0.23	0.14	1.75	1.03	-0.01	-0.02
Self-efficacy	73.58	17.72	-0.75	0.24	71.88	13.76	-0.34	0.10
Story quality	4.35	1.22	-0.49	0.55	3.84	1.44	-0.05	-0.34
Opinion essay quality	3.70	1.28	-0.18	-0.26	3.73	1.35	0.03	-0.36

Note. Metric and possible range for reported measures are as follows: alphabet task = number of correct letters, copy task = number of correct words, story and opinion essay spelling = percentage of correct words; dictated spelling = number of correct words (0-40); self-efficacy = scale ranging from 0 (*no chance*) to 100 (*completely certain*); story and opinion essay planning = scale ranging from 1 (*low*) to 6 (*high*); revision-detection = number of accurately detected errors (0-6); revision-correction = number of accurately corrected errors (0-6); story and opinion essay quality = scale ranging from 1 (*low*) to 7 (*high*).

Table 2

Correlations between all measures by grade group.

Measure	1	2	3	4	5	6	7	8	9	10	11	12
1. Alphabet task	–	.51***	.32***	.28***	.27***	.13	.16	.14*	.21**	.38***	.31***	.23**
2. Copy task	.55***	–	.25***	.24***	.33***	.10	.09	.11	.21**	.35***	.34***	.26***
3. Story spelling	.26**	.16*	–	.56***	.43***	.12	.20**	.11	.18*	.32***	.20**	.25***
4. Opinion spelling	.22**	.23**	.66***	–	.55***	.18*	.19**	.14*	.18**	.32***	.26***	.23***
5. Dictated spelling	.36***	.29***	.62***	.55***	–	.16*	.18**	.26***	.19**	.35***	.34***	.29***
6. Story planning	.16*	.03	-.01	-.08	.16*	–	.52***	.15*	.16*	.14*	.28***	.31***
7. Opinion planning	.11	.06	.19*	.12	.19*	.39***	–	.13	.08	.23**	.31***	.34***
8. Revision-detection	.12	.05	.20**	.19*	.30***	.13	.14	–	.36***	.22**	.19**	.33***
9. Revision-correction	.28***	.17*	.17*	.18*	.35***	.08	.18*	.43***	–	.29***	.32***	.21**
10. Self-efficacy	.15**	.13	.34***	.26**	.40***	.11	.08	.12	.10	–	.50***	.41***
11. Story quality	.34***	.35***	.11	.16*	.27***	.08	.11	.23**	.27***	.18*	–	.44***
12. Opinion essay quality	.35***	.23**	.17*	.23**	.33***	.12	.25**	.28***	.35***	.29***	.39***	–

Note. Correlations for Grades 4-6 (*n* = 171) are below the diagonal and correlations for Grades 7-9 (*n* = 205) are above the diagonal.

* $p < .05$. ** $p < .01$. *** $p < .001$.

To evaluate fit of the models we used the chi-square statistic (χ^2), the confirmatory fit index (CFI) and the root-mean-square error of approximation (RMSEA). CFI values greater than .95 and .90, and RMSEA values less than .06 and .10 are considered good and adequate fits, respectively (Hu & Bentler, 1999). As suggested by Byrne (2010), we used the χ^2 and CFI difference tests to test for group invariance. Evidence of noninvariance is claimed when $\Delta\chi^2$ is statistically significant and ΔCFI is greater than or equal to .01 (Chen, 2007; Cheung & Rensvold, 2002).

Before model evaluation, latent variables were scaled by imposing unit of loading identification constraints (Kline, 2005). The unstandardized coefficients of the alphabet task, opinion essay spelling, opinion essay planning, revision-detection, self-efficacy, and opinion essay quality on the respective factors were fixed to 1.0. Only the variance of the Transcription factor was constrained to equal 1.0, so that the second-order factor loadings were freely estimated.

Baseline models. The first evaluation of the model revealed an adequate fit to the data for the younger sample, $\chi^2(43, N = 171) = 79.02$, $p = .001$, CFI = .93, RMSEA = .07, $P(\text{rmsea}\leq.05) = .09$, and a very good fit for the older sample, $\chi^2(43, N = 205) = 43.64$, $p = .44$, CFI = .99, RMSEA = .01, $P(\text{rmsea}\leq.05) = .96$. An analysis of the modification indices (MIs) revealed a problem in the model regarding the dictated spelling indicator. In Grades 4-6, MIs for the regression weights revealed two parameters with MIs greater than 6.0, which represented the cross-loadings of dictated spelling on the Revision and Text Generation factors. Because there was no strong theoretical basis to specify these additional parameters, and given that the Spelling factor already had two other indicators, we decided to remove the dictated spelling indicator. Also, to produce the most parsimonious model, the non-significant paths for both groups were deleted (viz., Planning → Revision, Planning → Self-efficacy, and Revision → Self-Efficacy). As the effect of revision on text generation was marginally significant in both samples (*p*s > .08), we decided not to remove it. After this respecification, the final model provided a good fit to the data for Grades 4-6, $\chi^2(36, N = 171) = 52.56$, $p = .04$, CFI = .95, RMSEA = .05, $P(\text{rmsea}\leq.05) = .43$, and a very good fit to the data for Grades 7-9, $\chi^2(36, N = 205) = 29.36$, $p = .77$, CFI = 1.00, RMSEA < .001, $P(\text{rmsea}\leq.05) = .99$. Table 3 presents standardized and unstandardized regression coefficients for both samples. Although only story planning in Grades 4-6 had a

marginally significant factor loading (p = .06), all standardized factor loadings ranged from moderate to strong ($range_{4\text{-}6}$ = .46–.99; $range_{7\text{-}9}$ = .54–.99) indicating that the observed variables were good indicators of the latent constructs.

Transcription, planning, revision, and self-efficacy accounted for 76% and 82% of the variance in text generation quality, respectively, in Grades 4-6 and 7-9. Considering the structural part of the model, the effects of transcription on planning (T→P), revision (T→R), and self-efficacy (T→SE) were significant in Grades 4-6 ($\beta_{T\rightarrow P}$ = .33, p = .006; $\beta_{T\rightarrow R}$ = .57, p < .001; $\beta_{T\rightarrow SE}$ = .39, p < .001) and in Grades 7-9 ($\beta_{T\rightarrow P}$ = .39, p < .001; $\beta_{T\rightarrow R}$ = .58, p < .001; $\beta_{T\rightarrow SE}$ = .69, p < .001). The effect of transcription on text generation (T→TG) was significant in Grades 4-6 ($\beta_{T\rightarrow TG}$ = .60, p = .01), but it was not in Grades 7-9 ($\beta_{T\rightarrow TG}$ = .26, p = .23). To examine the indirect effects of transcription on text generation via planning (T→P→TG), revision (T→R→TG), and self-efficacy (T→SE→TG), we used modified Sobel tests (Sobel, 1982). The indirect effects mediated by planning and self-efficacy were significant in Grades 7-9 ($\beta_{T\rightarrow P\rightarrow TG}$ = .15, Sobel z = 2.55, p = .01; $\beta_{T\rightarrow SE\rightarrow TG}$ = .21, Sobel z = 2.05, p = .04), but they were not in Grades 4-6 ($\beta_{T\rightarrow P\rightarrow TG}$ = .03, Sobel z = 0.69, p = .49; $\beta_{T\rightarrow SE\rightarrow TG}$ = .03, Sobel z = 0.66, p = .51). The indirect effect of transcription on text generation via revision was significant in neither group (ps > .10). These results suggest that, for younger students, transcription contributes directly to text generation, but, for older students, transcription contributes indirectly to text generation, through planning and self-efficacy. As the baseline model was very good for both groups, invariance evaluation was conducted to analyze grade-group differences (see Table 4 for goodness-of-fit statistics).

Configural model. As the multiple-group model fitted the data very well, $\chi^2(72, N = 376) = 81.93$, p = .20, CFI = .99, RMSEA = .02, P(rmsea≤.05) = .99, we proceeded with invariance testing.

Measurement model. The model with constrained factor loadings showed no decrement in fit, $\chi^2(77, N = 376) = 86.58$, p < .21, CFI = .99, RMSEA = .02, P(rmsea≤.05) = 1.00, with χ^2 and CFI difference tests supporting noninvariance. Thus, there were no differences in factor loadings between Grades 4-6 and 7-9, indicating that the measures had the same meaning for both groups. After establishing measurement invariance, structural differences were examined.

Table 3

Unstandardized and standardized path coefficients by grade group.

Path	Grades 4-6 (*n* = 171)		Grades 7-9 (*n* = 205)	
	Unstandardized	Standardized	Unstandardized	Standardized
Transcription				
Transcription → Handwriting	2.90	.67***	3.03	.76***
Alphabet task[a]	1.00	.85	1.00	.74
Copy task	0.83	.64***	1.00	.69***
Transcription → Spelling	2.15	.53***	1.23	.64***
Story spelling	0.84	.81***	0.82	.75***
Opinion essay spelling[a]	1.00	.82	1.00	.75
Planning				
Story planning	0.61	.46 *ns*	.90***	.68***
Opinion essay planning[a]	1.00	.85	1.00	.76
Revision				
Detection[a]	1.00	.59	1.00	.54
Correction	1.15	.74***	1.03	.67***
Self-efficacy				
Self-efficacy[b]	1.00	1.00	1.00	1.00
Text generation				
Story quality	0.75	.56***	1.17	.75***
Opinion essay quality[a]	1.00	.71	1.00	.74
Transcription → Planning	0.31	.33**	0.41	.39***
Transcription → Revision	0.34	.57***	0.38	.58***
Transcription → Self-efficacy	6.83	.39***	9.38	.69***
Transcription → Text generation	0.54	.60*	0.23	.26 *ns*
Planning → Text generation	0.08	.09 *ns*	0.32	.39***
Revision → Text generation	0.44	.30 *ns*	0.33	.25 *ns*
Self-efficacy → Text generation	0.004	.09 *ns*	0.02	.31*

Note. For between-sample comparisons see unstandardized coefficients, but for within-sample comparisons see standardized coefficients. [a]Reference variable. [b]Single indicator of factor.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4

Summary of the goodness-of-fit statistics for tests of multiple-group invariance.

Model	χ^2	*df*	$\Delta\chi^2$	Δdf	*p*	CFI	ΔCFI
Configural Model	81.93	72	–	–	–	.99	–
Measurement Model	86.58	77	4.65	5	.46	.99	.00
Structural Model	102.91	86	16.33	9	.06	.98	.01
H → T and S → T equal	89.85	79	3.27	2	.20	.99	.00
T → P, T → R, and T → SE equal	92.70	82	2.84	3	.42	.99	.00
R → TG equal	92.85	83	0.16	1	.69	.99	.00
T → TG equal	97.22	84	4.37	1	.04	.98	.01
P → TG equal	98.31	84	5.46	1	.02	.98	.01
SE → TG equal	98.41	84	5.56	1	.02	.98	.01

Note. CFI = comparative fit index; H = handwriting; T = transcription; S = spelling; P = planning; R = revision; SE = self-efficacy; TG = text generation.

Structural model. There was a decrement in fit when factor loadings and structural paths were constrained to be equal across groups, $\chi^2(86, N = 376) = 102.91$, $p < .10$, CFI = .98, RMSEA = .02, $P(\text{rmsea} \leq .05) = .99$. As the χ^2 difference test was marginally significant, and the CFI difference test supported noninvariance, we went further in the analysis to determine noninvariant paths. A stepwise procedure was used, in which only invariant paths were hold. Firstly, we constrained the paths from transcription to handwriting and spelling. Secondly, we constrained the significant paths in both samples, namely, those from transcription to planning, revision, and self-efficacy. Thirdly, we constrained the path from revision to text generation. In all of these three steps, difference tests supported noninvariance. Finally, when we constrained the paths from planning, self-efficacy, or transcription on text generation, the fit of the model declined significantly, $\Delta\chi^2(1) > 4.36$, ps $< .05$; ΔCFI = .01. These analyses indicated that these three paths differed significantly between grade groups. Transcription contributed more to text generation quality in Grades 4-6, while planning and self-efficacy contributed more to text generation quality in Grades 7-9.

Discussion

Significance of Findings

The findings of the present study are in line with the not-so-simple view of writing (Berninger & Winn, 2006) by showing that transcription and self-regulation, specifically, planning, revision, and self-efficacy are crucial for text generation in developing writing. The analyses indicated that the model under test was a very good description of the data for both Grades 4-6 and 7-9. Moreover, the measurement part of the model was similar across grade groups showing that the constructs had the same meaning for both groups. Notably, we showed that these skills explained 76% and 82% of the variance in writing quality in Grades 4-6 and 7-9, respectively. Of interest, we found some differences between these two groups regarding the relationship between transcription, planning, revision, self-efficacy, and text generation.

In line with our hypothesis, transcription constrained text generation in Grades 4-6 but not in Grades 7-9. This result agrees with Berninger (1999) who showed that the explained variance in writing quality by transcription decreased from Grades 4-6 to 7-9.

The direct contribution of low-level skills to writing quality in younger students might reflect a lack of automaticity in transcription (Graham et al., 1997). Because developing writers struggle with the orthographic-motor and orthographic-linguistic components of writing, these components are likely to interfere with the quality of their written texts (Berninger, 1999; Bourdin & Fayol, 1994; Olive & Kellogg, 2002). This was not the case for the older sample, in which transcription had no direct effect on writing quality. A reasonable explanation is that older students' handwriting and spelling skills were sufficiently automatized to directly constrain text generation. This is not to say that these low-level skills are no longer important. On the contrary, a main result from the present study was that transcription continued to exert its influence on writing quality after Grades 4-6, but indirectly, through its impact on planning and self-efficacy.

Consistent with our predictions, older students' transcription skills contributed indirectly to text generation via planning. Still, when we scrutinized this effect, the hypothesis was only partially confirmed because transcription contributed to text generation in Grades 7-9 as much as in Grades 4-6. Thus, in both groups, the greater the transcription fluency, the better their planning skills were. Nevertheless, while these more developed planning skills were associated to better texts in Grades 7-9, they were not in Grades 4-6. Possibly, younger students lack either sufficient planning abilities or the knowledge to appropriately use them in writing (Englert, Raphael, Fear, & Anderson, 1988; Lin et al., 2007). All in all, whereas preplanning might emerge in Grades 4-6, it only seems to be sufficiently developed to be used for the benefit of text production in Grades 7-9.

Regarding self-efficacy, we found that it was influenced by transcription not only in Grades 4-6 but also in Grades 7-9. This indicates that even older students may rely on their handwriting and spelling abilities to gauge their own sense of confidence. Nonetheless, while self-efficacy influenced older students' writing quality, it did not in the younger sample. It is possible that young writers were not able to translate their perceived self-efficacy into corresponding performance. Students might have lacked the necessary knowledge and skills to proactively adjust their writing behavior to their appraisals of personal capabilities (Bandura, 1997). Although this explanation assumes that students' self-efficacy judgments were accurate, this could have not been the case. Indeed, given that self-efficacy influence task choice, expended effort, perseverance,

and emotional reactions, faulty self-judgments could also explain why novice writers' writing performance was unrelated to self-efficacy.

Of concern were the results about revision, which were similar across grade groups. Although students' transcription fluency predicted students' skills to revise meaning errors, these skills were not related to writing quality. This latter result might be explained differently according to grade group. It is possible that younger students lacked sufficient revising skills. By contrast, it might be that older students, albeit being in the possession of those skills, did not use them to increase the quality of their writing. It could be argued that students did not have enough time to employ their revising skills in an 8-min writing task. This was probably not the case because, in a writing task without time limits, eighth graders only spent 10% of their writing time revising their texts (Fidalgo et al., 2008). As revision places large demands on working memory, it is possible that older students were not able to write their texts and, simultaneously, revise them for meaning (Hacker, 1994). Probably, postponing revision would have improved text quality (Chanquoy, 2001).

Finally, the predicted relationship between the self-regulation variables in Grades 7-9 was not found. In the sample studied, writers' ability to generate written plans before writing was not linked to their ability to revise meaning errors, suggesting that these skills did not develop in tandem. This result might be explained by the different nature of these strategies: Writers plan what they are going to write, but they revise what they have already written. In addition, the lack of relationship between planning and revising is possibly related to the finding that while some students tend to adopt planning strategies, others tend to prefer revising strategies (Kieft, Rijlaarsdam, Galbraith, & van der Bergh, 2007). Unexpectedly, the paths from planning and revising to self-efficacy were also non-significant. This result might be related to the use of a general self-efficacy measure, not explicitly tied to the use of writing self-regulatory strategies. Bruning, Dempsey, Kauffman, McKim, and Zumbrunn (2013) found empirical support for a 3-factor model of writing self-efficacy comprising self-efficacy for writing ideation, writing conventions, and writing self-regulation. The assessment of specific dimensions of self-efficacy, such as *self-efficacy for self-regulated learning* (Zimmerman & Martinez-Pons, 1990), can inform us better about how students' beliefs are influenced by their planning and revising skills.

Limitations and Future Research Directions

Some limitations in the present study need to be considered, as well as possible ways to further explore the development of writing. First, the data came from a single group of schools. However, the sample included a full-range of backgrounds and the main results confirmed the literature reviewed.

Second, by asking students' to plan and revise, we do not know if they were able to do it spontaneously in their texts. Indeed, it is as important to have the appropriate skills to use a strategy, as to autonomously decide when to employ that strategy. Future research should therefore focus on the extent to which students can deliberately plan and revise and how this impacts writing performance.

A third limitation, which is related to the previous one, is that online planning and online revision were not examined. By analysing the online management of these processes we could deepen our understanding about their interaction and temporal distribution as a function of transcription.

Fourth, working memory and writing knowledge were not included in the model. Working memory is a pivotal system in the relationship between low- and high-level writing processes (Kellogg, 1996; McCutchen, 1996). The inclusion of a working memory factor could have provided valuable information about the evolution of this relationship during school years. Also, the students' writing knowledge and its impact on writing has been widely discussed in the literature (Englert et al., 1988; Graham et al., 1993; Lin et al., 2007; McCutchen, 2011). Very early on, knowledge about writing predicted writing quality, above and beyond transcription and self-regulation (Olinghouse & Graham, 2009). The relationship of writing knowledge with these processes deserves further attention.

Finally, any conclusion drawn from our results is limited to the indicators used and to writing assessment, as writing instruction was not studied in this project. Additional self-regulatory strategies, such as goal-setting, self-monitoring, or self-instructions (Graham & Harris, 2000; Harris et al., 2010; Zimmerman & Risemberg, 1997) should be examined. Likewise, as intraindividual differences at the text, sentence, and word levels were found (Wagner et al., 2011; Whitaker et al., 1994), other text generation measures should be considered in future research.

Educational Implications

This study confirmed that transcription contributes to developing writing (Berninger & Swanson, 1994; Graham et al., 1997), and is likely to hamper the acquisition and development of high-level writing processes, which characterizes mature writing (Alamargot et al., 2010). For that reason, transcription should be taught and practiced until a proficient level of automaticity is achieved. Indeed, through its influence on planning maturity and self-efficacy beliefs, transcription stills constraining older students' writing. Educational research has already shown the positive effects of interventions targeting handwriting (e.g., Christensen, 2004; Jones & Christensen, 1999) and spelling (e.g., Berninger et al., 2002; Berninger et al., 1998; Graham, Harris, & Fink-Chorzempa, 2002). In spite of that, these skills tend to be neglected by teachers beyond the initial years of learning to write.

The findings that in Grades 4-6 self-regulation variables were influenced by transcription, but did not influence text quality, suggest that this developmental age may be a sensitive period to promote planning and revising as well as to nurture self-efficacy beliefs. Particular attention should be given to the development of revising skills because even older students do not seem to use them as an aid to write better texts. It has been widely demonstrated that teaching self-regulatory strategies builds self-efficacy and enhances writing quality (see Harris & Graham, 2009, for further discussion). Even though it is not desirable that these skills become fully automatized (McCutchen, 1988), through teaching, they can become fluent and increase writing efficiency. To fulfill students writing needs, the design of intervention programs tapping low- and high-level skills is clearly warranted (for successful programs see Berninger et al., 2006; Berninger et al., 2002).

In conclusion, the present study analyzed the role of transcription and self-regulation in text generation quality throughout development. Transcription proved to be the most restrictive factor to writing quality, directly, in Grades 4-6, and, indirectly via planning and self-efficacy, in Grades 7-9. Our study adds to a growing body of research showing that writing development is heavily based on transcription and self-regulation. If we want to enhance students' written composition across school years, none of these sets of skills should be left behind.

STUDY 2

CHILDREN'S HIGH-LEVEL WRITING SKILLS

DEVELOPMENT OF PLANNING AND REVISING AND THEIR CONTRIBUTION TO WRITING QUALITY

Published manuscript:
Limpo, T., Alves, R. A., & Fidalgo, R. (2014). Children's high-level writing skills: Development of planning and revising and their contribution to writing quality. *British Journal of Educational Psychology*, *84*, 177-193. doi:10.1111/bjep.12020

Thirty years ago, Hayes and Flower (1980) introduced the first cognitive model of written composition. Still today, this is one of the most prominent models within the cognitive approach to writing. One of the reasons for its longstanding impact was the identification of the cognitive processes involved in writing a text (Alves & Haas, 2012). From thinking-aloud protocols analysis, Hayes and Flower (1980) inferred three writing processes, namely, planning, translating, and revising, which recursively interact during skilled writing. Although these processes were subsequently elaborated, they continue to represent the core cognitive component in more recent cognitive writing models (Berninger & Winn, 2006; Hayes, 1996, 2012; Kellogg, 1996).

The present study investigated the development of planning and revising skills in Grades 4-9, and analysed the contribution of these high-level skills to writing quality. In what follows, we define planning, translating, and revising processes, and outline how students' planning and revising skills contribute to the quality of their texts.

High-Level Writing Processes

The planning process involves generating and organizing ideas, and setting goals (Hayes & Flower, 1980). As planning can occur before or during translating, a distinction was made between advanced and online planning (Berninger & Swanson, 1994). The central function of planning, even in adults, is generating content (Torrance, Thomas, & Robinson, 1999). Writers plan their text by extracting information from the task environment and by searching for content in their long-term memory. When necessary, this generated material is (re-)organized in a writing plan that guides text production. During planning, writers also formulate goals for their texts, and delineate conceptual plans to achieve them (Hayes & Flower, 1986).

Based on research on developing writing, Berninger et al. (1992) proposed two components of the translating process: text generation and transcription. Text generation is the transformation of ideas into language representations in the working memory.

Transcription is the transformation of those representations into written language, which includes the low-level skills of spelling and handwriting.

The revision process can be activated at any point during writing to evaluate and introduce changes at the word, sentence, or text level (Chanquoy, 2009; Fitzgerald, 1987). The timing of revision in relation to translation allowed the distinction between online and posttranslation revision (Berninger & Swanson, 1994). Revision involves two sub-processes: problem detection, which includes schema-guided reading and text evaluation, and problem correction, which involves the selection of a revising strategy and its implementation (Butterfield et al., 1996; Hayes, 2004).

Berninger and colleagues conducted cross-sectional studies from Grade 1 to 9 (age 6 to 15) and found that planning, translating, and revising had different rates of development (Berninger, Cartwright, Yates, Swanson, & Abbott, 1994; Berninger, Whitaker, Feng, Swanson, & Abbott, 1996; Berninger et al., 1992). Transcription and text generation were the first to emerge, followed by online planning and online revision (Grades 1-3). The last processes to develop were advanced planning and posttranslation revision (Grades 4-6), which were only fully operational by Grades 7-9.

Planning Skills and Writing Quality

Several correlational studies have analysed how students' preplanning skills are related to their compositional quality. In the studies reviewed below, preplanning skills were assessed through the complexity of students' written plans (see Hayes & Nash, 1996 for a review on planning measures). Outlines and graphic organizers were considered as the most advanced form of preplanning.

In Grades 2 and 4, it was found that students' plans did not predict writing quality (Olinghouse & Graham, 2009). Likewise, in Grades 4-6, preplanning skills were not related to writing performance (Whitaker et al., 1994). Only in Grades 7-9, the plan generated before writing were positively correlated with compositional quality (Berninger et al., 1996). Thus, while younger students were able to make written plans, only older students seemed to use them to guide text production (Limpo & Alves, 2013a). This might have happened because younger students' written plans tended to be very similar to their texts, which means that they are not differentiating planning from translating (Bereiter & Scardamalia, 1987).

There is strong evidence that planning instruction is a way to promote students' writing performance (for meta-analyses see Graham, McKeown, et al., 2012; Graham & Perin, 2007). Harris, Graham, and Mason (2006) demonstrated that children as young as 7-years-old can beneficiate from interventions targeting planning skills. Second-graders with difficulties in learning to write were taught a general planning strategy, and genre-specific strategies for narrative and expository writing in tandem with self-regulation procedures. By using these strategies, students were able to write longer and better texts than controls. The advanced plan might have functioned as an external memory where children stored their ideas. Moreover, it might have freed up cognitive resources for the other higher level writing processes by reducing children's need to plan during writing (cf. Kellogg, 1988).

Revising Skills and Writing Quality

Among other factors, the influence of students' revising skills on writing quality depends on writers' developmental level and the nature of the revision (mechanical vs. substantive). It seems that young writers' revisions have a limited impact on text quality (Fitzgerald & Markham, 1987; MacArthur, 2012). Indeed, only in Grades 7-9, text revision led to an improvement at the word, sentence, and text levels (Berninger et al., 1996). A possible reason for this is that younger students focused on mechanical and local problems, while older writers also considered meaning and global problems (Graham et al., 1993; MacArthur, Graham, & Harris, 2004). Nonetheless, a robust result about revision is that meaning errors are harder to detect and correct than surface errors for school-age children, as well as for adults (Butterfield, Hacker, & Plumb, 1994). Several explanations have been proposed (for a review see MacArthur, 2012). Writers may lack the knowledge of appropriate evaluation criteria or may have a limited conception of revision as proofreading (Graham et al., 1993). It might also be that they have deficient reading strategies (McCutchen, Francis, & Kerr, 1997), or that substantive revisions place large demands on working memory (Hacker, 1994). Regarding revision sub-processes, it was suggested that younger students struggle more with detecting errors than correcting them. Indeed, Beal (1990) showed that students in Grade 4 detected less meaning errors than children in Grade 6. Even though fourth

graders were as likely as sixth graders to correct the errors adequately once they were detected.

Several studies have analysed the impact of revision instruction on writing performance, and results are generally positive (for meta-analyses see Graham, McKeown, et al., 2012; Graham & Perin, 2007; but see Torrance, Fidalgo, & García, 2007). De La Paz, Swanson, and Graham (1998) taught a modified version of the *Compare*, *Diagnose*, and *Operate* strategy (CDO strategy; developed by Scardamalia & Bereiter, 1983) to eight-graders with learning disabilities. This revision routine prompted students to deal first with global problems and then with local ones. Students using the CDO strategy improved not only their revising behaviour but also the quality of their texts. The authors suggested that the strategy encouraged them to consider the whole text and provide them an executive support to manage the revision process.

The Present Study

Covering a large developmental window (Grades 4-9, with about 60 students per grade), this study examined the development of planning and revising, and the contribution of these skills to writing quality. Compared to previous studies also focused on the development of high-level writing skills (e.g., Berninger et al., 1996; Whitaker et al., 1994), the main contribution of our work is twofold. Firstly, we used more controlled and comprehensive measures of planning, revising, and text quality. Planning skills were studied in narrative writing, whose underlying schema is expected to be already acquired by Grade 4 (Berman & Slobin, 1994). Given the wide range of grades assessed, the use of this genre minimized potential differences across grades due to declarative knowledge, which could impact students' planning behaviour. Students' revising skills were analysed considering the nature of revision (viz., mechanical vs. substantive) and the underlying sub-processes (viz., detection vs. correction). Students were also asked to revise a provided text and not their own texts (for a methodological discussion on the study of revision see Butterfield et al., 1994). This enabled us to remove the effect that differences among writers' texts would have on revision. To control for the influence of topic knowledge on substantive revision (McCutchen et al., 1997), the provided text was a fictional narrative requiring no prior topic knowledge to

be understandable. Regarding writing quality, all texts were evaluated by means of a holistic scale considering ideas quality, organization, sentence structure, and vocabulary.

Secondly, we examined the incremental validity of planning and revising in predicting writing quality in Grades 4-6 and 7-9, which, to the best of our knowledge, had not been tested. This kind of analysis provides additional evidence of the contribution of high-level skills to writing because it tests their unique contribution over well-known predictors. Given the complexity of writing, demonstrating the incremental validity of these skills is a way to highlight their importance to educational researchers and practitioners. Indeed, this study's findings may be relevant to guide writing instruction by informing about appropriate periods to target a particular writing process.

In this study, students from Grade 4 to 9 were asked to plan and write a narrative. Also, they were asked to detect and correct mechanical and substantive errors in the same genre. Our first aim was to trace the development of planning and revising. Due to instruction and maturation, we expected that planning would increase from grade to grade (Hypothesis 1; Alamargot & Fayol, 2009). Similarly, we expected that mechanical and substantive revision would increase throughout schooling (Hypothesis 2). Furthermore, according to the literature on revision, we predicted that student's ability to correct errors would be higher than students' ability to detect them (Hypothesis 3).

Our second aim was to examine the contribution of high-level writing skills to writing quality in Grades 4-6 (age 9 to 12) vs. Grades 7-9 (age 12 to 15). Separate regression analyses were conducted to predict writing quality for the two grade groups. Six control variables and five high-level writing variables were included in the regression model. Three control variables were non-writing: gender, school achievement, and age. Several studies have found that girls surpass boys with respect to writing performance (for a review see Gelati, 2012). Because writing plays a key role in students' assessments at school, those with better grades would probably write qualitatively better texts. Age was introduced as a control variable because, to obtain more reliable and powerful regression models, students in Grades 4-6 and 7-9 were grouped. This split was also based on the fact that, from Grade 6 to 7, children change from the second to the third Stage of Basic Education. The writing-related control

variables were: handwriting fluency, spelling, and text structure. It has been demonstrated that transcription skills are largely associated with writing quality (Berninger & Swanson, 1994; Graham et al., 1997). The text structure variable was included as a measure of students' knowledge about the characteristic elements of narrative texts. It was found that genre knowledge predicted writing performance (Olinghouse & Graham, 2009). The high-level writing variables included story planning and four revision variables: mechanical detection, mechanical correction, substantive detection, and substantive correction. We expected that high-level skills would predict compositional quality above and beyond control variables in Grades 7-9, but not in Grades 4-6 (Hypothesis 4). This hypothesis was based on the previously surveyed research, which supported a larger contribution of high-level writing skills in older than younger students.

Method

Participants

The participants were 419 Portuguese native speakers in Grades 4-9. Five students with special education needs, 14 students who missed one of the two administration sessions, and 19 students who did not follow task instructions were excluded from the analyses. Demographic data from the remaining 381 students is presented in Table 1.

Setting

Basic Education in Portugal lasts 9 years and comprises three stages: Grades 1-4 (age 6 to 10), Grades 5-6 (age 10 to 12), and Grades 7-9 (age 12 to 15). Crucial differences between stages are as follows: Stage 1 is provided in primary schools and only one teacher is responsible for teaching the four main courses; Stage 2 is provided in basic schools and children have one teacher for each of the nine courses; finally, Stage 3 is provided in basic or secondary schools and students have eleven courses.

Regarding the teaching of writing in Portugal, a gradual shift from a product- to a process-oriented approach has been occurring (Álvares Pereira, Aleixo, Cardoso, & Graça, 2010). For instance, in a recent reform of the Portuguese Language curriculum

(Reis et al., 2009), the explicit teaching in planning, translating, and revising processes is deemed as a critical component of writing instruction. Although writing is the preferred learning and assessment tool across courses and schooling, explicit writing instruction only occurs in Portuguese Language classes.

Table 1
Demographic data for the participating students by grade.

	Grade					
Measure	4	5	6	7	8	9
Gender (*N*s)						
Girl	26	23	45	28	30	39
Boy	32	30	20	41	31	36
Age (in years)						
M (*SD*)	10.0 (0.4)	11.0 (0.6)	12.1 (0.5)	13.0 (0.4)	14.0 (0.4)	15.0 (0.5)
Range	9.4–11.0	10.4–13.0	11.4–12.1	11.9–14.4	12.7–15.3	14.4–16.8
Mother's Ed. Level (%)						
Grade 4 or below	25.9	9.4	18.5	14.5	9.8	14.7
Grade 9 or below	34.5	52.8	46.2	46.4	34.4	52.0
High school	19.0	22.6	16.9	20.3	26.2	14.7
College or above	20.7	7.5	16.9	17.4	27.9	16.0
Unknown	0.0	7.5	1.5	1.4	1.6	2.7
School marks[a] (1-5)						
$M_{Portuguese}$ (*SD*)	3.83 (0.96)	2.96 (0.68)	3.37 (0.74)	2.96 (0.63)	3.34 (0.91)	3.11 (0.80)
$M_{Mathematics}$ (*SD*)	3.67 (0.98)	3.02 (0.67)	3.12 (0.84)	2.91 (0.68)	3.18 (0.79)	2.95 (0.79)
$M_{History}$ (*SD*)	4.03 (1.03)	2.91 (0.69)	3.68 (0.85)	3.30 (0.67)	3.69 (0.85)	3.25 (0.70)

Note. [a]The average mark of these courses was used as a measure of students' school achievement.

Procedure

The present study is part of a larger research project investigating writing development. Students performed several tasks, but only those relevant to the present study are described next. Data collection occurred in classroom groups with 20-25 students during two 45-min sessions in the month of May. Students started each session by planning and writing a story about the following topic: "Tell a story about a child who lost his/her pet". The experimenter gave students 3 min to plan the text, that is, to write down everything that could help them to write the text (for a similar procedure see Berninger et al., 1996). Then, students had 8 min to write it. Anytime a student stopped writing he or she was prompted to continue. Given the wide range of participants' grade level, the duration of the planning and writing tasks was chosen to allow all students to

generate and develop their ideas without fatiguing the younger ones. After the writing task, in the first session, participants performed the alphabet task (Berninger et al., 1992). They were asked to write the lowercase letters of the alphabet during 15 s, legibly and as quickly as possible. In the second session, participants were asked to revise a story, in which we implanted six mechanical errors (two errors of three kinds: spelling, punctuation, and syntax errors), and six substantive errors (two errors of three kinds: missing, inconsistent, and out-of-sequence sentences). This task was completed in two phases. Firstly, students marked everything they thought was not right (detection phase). Secondly, the experimenter gave them the text with all target errors marked and students corrected them (correction phase). In both sessions two adults were always present in the room to guarantee that experimental procedures were carried out as intended and that students did not look at their peer's sheets, particularly, in the revision task.

Measures

Handwriting fluency. To assess students' handwriting fluency we counted the total number of legible letters of the alphabet written in the right sequence during 15 s.

Spelling. The percentage of words spelled correctly in the story was used as a measure of spelling skills.

Text structure. Texts were scored to determine if they included the characteristic elements of a story. Eight narrative elements were considered: characters, time, space, initiating event, attempt, internal response, consequence, and reaction (based on Stein & Trabasso, 1982). For each element, one point was awarded if it was present.

Planning. A rating scale ranging from 1 (*low*) to 6 (*high*) was used to assess students' planning skills. The scores 1 and 2 were attributed to plans that represent no preplanning and minimal preplanning, respectively. Plans summarizing the text received a score of 3, and plans with topics slightly elaborated in the text received a score of 4. The scores 5 and 6 were attributed to plans with emergent subordination (i.e., rudimentary macrostructure) and structural relationships (e.g., graphic organizers), respectively. This scoring scale was based on those developed by Whitaker et al. (1994), and Olinghouse and Graham (2009).

Revision. Four measures were extracted from the revision task. The number of mechanical errors accurately detected or corrected was used as a measure of mechanical detection and mechanical correction, respectively. The number of substantive errors accurately detected or corrected was used as a measure of substantive detection and substantive correction, respectively (maximum of 6 points per score).

Writing quality. Two pairs of graduate students, blind to study purposes, rated writing quality by means of a scale ranging from 1 (*low*) to 7 (*high*). Raters were told to consider ideas quality, organization, sentence structure, and vocabulary, and to give the same weight to these factors. To control for expected differences between grade levels, one pair of judges rated all texts from Grades 4-6, and the other pair rated all texts from Grades 7-9. To avoid biased judgments all texts were previously typed and corrected for spelling, punctuation, and capitalization errors (Berninger & Swanson, 1994). Inter-rater reliability using Cohen's weighed Kappa for writing quality was .78 and .84, respectively, in Grades 4-6 and 7-9. Thus, the final score was the average for the two judges.

Measures Reliability

At each grade, a second judge rescored the tasks for 20% of the students. Inter-rater reliability, using Cohen's weighed Kappa, for text structure, planning, and revision was .98, .88, and 1.00, respectively. Inter-rater reliability for the alphabet task and spelling, using Intraclass Correlation Coefficient, was .991 and .997, respectively.

Results

Data analyses encompassed two phases. In the first one, analyses of variance (ANOVAs) were conducted to analyse the development of planning, as well as mechanical and substantive detection and correction across schooling. In the second phase, regression analyses were performed to examine the contribution of planning and revising skills to writing quality.

Development of Planning and Revising Skills

To examine the development of planning skills throughout school years, we conducted a one-way ANOVA (see Table 2 for descriptive statistics). As predicted, we found significant effect of grade, $F(5, 375) = 18.33$, $p < .001$, $\eta^2_p = 0.20$. Planned contrasts revealed a decrease from Grade 4 to 5 ($p = .002$, $d = -0.62$), an increase from Grade 5 to 6 ($p = .001$, $d = 0.72$), a stationary period from Grade 6 to 7 ($p = .33$, $d = -0.16$), and increases from Grade 7 to 8 ($p = .01$, $d = 0.42$) and 8 to 9 ($p < .001$, $d = 0.68$).

The development of mechanical and substantive revising skills throughout school years was analysed by means of two 2 (revision sub-process) x 6 (grade) ANOVAs, with repeated measures on the first factor (see Table 6 for descriptive statistics). Regarding mechanical revision, we found a main effect of revision sub-process, $\Lambda = .66$, $F(1, 375) = 192.53$, $p < .001$, $\eta^2_p = 0.34$, and a main effect of grade, $F(5, 375) = 37.61$, $p < .001$, $\eta^2_p = 0.33$. The interaction between these two variables was also significant, $\Lambda = .97$, $F(5, 375) = 2.46$, $p = .03$, $\eta^2_p = 0.03$, and was examined with tests of simple main effects. We found that for all grade levels, students were better at correcting mechanical errors than detecting them, $\Lambda < .97$, Fs$(1, 375) > 10.29$, ps $< .001$, $\eta^2_p > 0.03$. Furthermore, tests of simple main effects revealed significant differences across grades for mechanical detection, $F(5, 375) = 21.19$, $p < .001$, $\eta^2_p = 0.22$, as well as for mechanical correction, $F(5, 375) = 29.58$, $p < .001$, $\eta^2_p = 0.28$. These significant effects were followed-up by planned contrasts. For mechanical detection, these tests showed a decrease from Grade 4 to 5 ($p = .02$, $d = -0.55$), which was followed by increases from Grade 5 to 6 ($p = .03$, $d = 0.45$) and 6 to 7 ($p = .007$, $d = 0.45$). Although these skills remained stable from Grade 7 to 8 ($p = .02$, $d = 0.01$), they clearly levelled up from Grade 8 to 9 ($p < .001$, $d = 0.70$). Similar tests showed that mechanical correction levelled off from Grades 4 to 5 ($p = .54$, $d = -0.12$), increased from Grade 5 to 6 ($p = .01$, $d = 0.45$), and levelled off again from Grade 6 to 7 ($p = .09$, $d = 0.45$). A growing trend was found throughout the next grades, with robust increases from Grade 7 to 8 ($p = .004$, $d = 0.51$), and 8 to 9 ($p = .009$, $d = 0.47$).

Concerning substantive revision, we found a main effect of revision sub-process, $\Lambda = .97$, $F(1, 375) = 12.86$, $p < .001$, $\eta^2_p = 0.03$. Similarly to mechanical revision, students were better at correcting substantive errors than detecting them. We also found

a main effect of grade, $F(5, 375) = 9.41$, $p < .001$, $\eta^2_p = 0.11$. Planned contrasts revealed that substantive revision remained stable from Grade 4 to 5 ($p = .76$, $d = -0.06$), increased from Grade 5 to 6 ($p = .01$, $d = 0.41$), and levelled off again from Grade 6 to 7 ($p = .84$, $d = -0.03$). Although there was a growing trend from Grade 7 to 8 ($p = .06$, $d = 0.25$) and 8 to 9 ($p = .18$, $d = 0.17$), the differences between these grades were not larger enough to be statistically significant. The interaction between revision sub-process and grade was not reliable, $F < 1$.

Table 2

Descriptive statistics for planning and revision measures by grade.

	Grade					
Measure	4	5	6	7	8	9
Planning (1-6)						
M	2.57	1.83	2.63	2.42	2.98	3.81
SD	1.42	0.91	1.28	1.38	1.28	1.14
Me	2.5	2	2	2	3	4
Min-Max	1-4	1-4	1-4	1-5	1-6	1-6
Mechanical Detection (0-6)						
M	1.64	1.08	1.58	2.17	2.18	3.15
SD	1.00	1.04	1.18	1.41	1.50	1.25
Me	2	1	1	2	2	3
Min-Max	0-3	0-4	0-5	0-5	0-5	0-6
Mechanical Correction (0-6)						
M	2.26	2.11	2.71	3.07	3.70	4.27
SD	1.09	1.35	1.32	1.26	1.20	1.20
Me	2	2	3	3	4	4
Min-Max	0-5	0-5	0.5	0.5	0-6	0-6
Substantive Detection (0-6)						
M	1.02	0.89	1.23	1.26	1.57	1.79
SD	1.00	0.91	1.13	1.02	1.44	1.18
Me	1	1	1	1	1	2
Min-Max	0-3	0-3	0-5	0-4	0-5	0-5
Substantive Correction (0-6)						
M	1.10	1.13	1.60	1.51	1.77	1.96
SD	0.83	0.86	1.04	0.95	1.16	0.94
Me	1	1	2	2	2	2
Min-Max	0-2	0-3	0-5	0-4	0-4	0-5

Contribution of High-Level Writing Skills to Writing Quality

Table 3 shows means and standard deviations for the regression variables, along with their intercorrelations, for Grades 4-6 and 7-9. Regarding control variables, achievement was positively correlated with almost all variables in both groups. Age was also correlated with almost all other variables, but only in the older group. Transcription variables had higher correlations with each other than with other control variables. Revision variables were moderately correlated in both groups, but they were only correlated with planning in the older group.

To examine whether students' high-level writing skills made a unique contribution to writing quality, we conducted hierarchical regression analyses. Separate analyses by grade groups were conducted to predict writing quality (see Table 4). For both analyses, Step 1 included the six control variables, and on Step 2 the five high-level variables were added.

Table 3

Correlations, means, and standard deviations for regression variables by grade group.

	1	2	3	4	5	6	7	8	9	10	11
1. Age		-0.06	0.18	0.22	-0.001	0.35	0.22	0.31	0.14	0.15	0.17
2. Achievement	-0.27		0.29	0.29	-0.12	0.11	0.20	0.18	0.26	0.25	0.40
3. Handwriting	0.34	0.15		0.32	0.06	0.13	0.25	0.13	0.14	0.21	0.31
4. Spelling	-0.04	0.25	0.26		-0.10	0.12	0.42	0.30	0.11	0.18	0.20
5. Text Structure	0.21	0.06	0.23	-0.02		0.08	0.09	0.09	-0.01	-0.01	0.21
6. Planning	-0.02	0.27	0.15	-0.01	0.13		0.05	0.19	0.15	0.16	0.28
7. Mec. Detection	-0.07	0.34	0.13	0.20	0.03	0.10		0.37	0.12	0.36	0.20
8. Mec.Correction	0.09	0.34	0.15	0.27	0.06	0.09	0.32		0.06	0.25	0.18
9. Sub. Detection	0.05	0.25	0.12	0.19	0.07	0.13	0.23	0.14		0.36	0.19
10. Sub. Correction	0.18	0.25	0.28	0.16	0.12	0.11	0.14	0.24	0.43		0.32
11. Writing Quality	0.28	0.24	0.34	0.11	0.31	0.06	0.03	0.23	0.22	0.24	
Grades 4-6											
M	11.07	3.41	14.64	95.72	6.50	2.37	1.45	2.38	1.06	1.30	4.35
SD	1.02	0.83	5.09	4.13	1.35	1.28	1.11	1.28	1.03	0.95	1.20
Grades 7-9											
M	14.00	3.18	20.93	98.03	6.60	3.10	2.53	3.70	1.55	1.75	3.84
SD	0.95	0.67	5.43	2.13	1.30	1.39	1.45	1.32	1.23	1.03	1.44

Note. Values below the diagonal are Grades 4-6 (n = 176) and correlations equal or above .15 are statistically significant (α = .05). Values above the diagonal are for Grades 7-9 (*n* = 205) and correlations equal or above .14 are statistically significant (α = .05). Mec. = mechanical; Sub. = substantive.

In Grades 4-6, the control variables significantly predicted writing quality, R^2 = .27, $F(6, 169) = 10.30$, $p < .001$. However, when the high-level variables were entered, there was no increase in the prediction of writing quality, R^2 = .30, $F_{change}(5, 164)$ = 1.25, p = .29. Only age, achievement, handwriting fluency, and text structure significantly contributed to writing quality. In Grades 7-9, Step 1 of the analysis was significant, R^2 = .32, $F(6, 198) = 15.37$, $p < .001$. Moreover, there was a significant increase in the prediction of writing quality on Step 2, R^2 = .38, $F_{change}(5, 193) = 3.54$, p = .004. This means that 6% of the variance associated with writing quality was uniquely explained by high-level writing skills. Planning and substantive correction, along with gender, achievement, and text structure, significantly explained writing quality variability.

Table 4

Regression model predicting writing quality by grade group.

	Grades 4-6 (n = 176)			Grades 7-9 (n = 205)		
Predictor	*B*	*SE*	*t*	*B*	*SE*	*t*
Step 1						
Gender	-0.31	0.17	-1.86	-0.59	0.18	-3.34***
Age	0.28	0.09	3.16**	0.24	0.09	2.58*
Achievement	0.37	0.11	3.44***	0.76	0.14	5.39***
Handwriting Fluency	0.03	0.02	1.77	0.03	0.02	1.84
Spelling	0.001	0.02	0.05	0.00	0.04	0.06
Text Structure	0.19	0.06	3.11**	0.26	0.07	3.96***
Step 2						
Gender	-0.21	0.18	-1.20	-0.63	0.17	-3.64***
Age	0.24	0.09	2.65**	0.15	0.10	1.44
Achievement	0.35	0.12	2.92**	0.65	0.14	4.54***
Handwriting Fluency	0.04	0.02	1.97*	0.03	0.02	1.50
Spelling	-0.01	0.02	-0.27	0.01	0.05	0.13
Text Structure	0.19	0.06	3.06**	0.25	0.07	3.85***
Planning	-0.05	0.07	-0.70	0.16	0.07	2.43*
Mechanical Detection	-0.13	0.08	-1.67	-0.03	0.07	-0.48
Mechanical Correction	0.09	0.07	1.18	-0.04	0.07	-0.52
Substantive Detection	0.14	0.09	1.52	-0.05	0.07	-0.61
Substantive Correction	0.03	0.10	0.28	0.30	0.09	3.17**

Note. The gender variable was dummy codded (0 = girl; 1 = boy).
* $p < .05$. ** $p < .01$. *** $p < .001$.

Discussion

The first aim of the present study was to analyse the development of planning and revising from Grade 4 to 9. We examined whether grade affected planning, and whether grade and revision sub-process (detection vs. correction) affected mechanical and substantive revision. The second aim of the present study was to analyse the contribution of students' high-level skills to writing quality, after controlling a set of variables writing and non-writing related.

The predicted growth tendency of the planning skills across schooling was found (Hypothesis 1). From Grade 4 to 9, there was an increase of 1.2 in story planning. Agreeing with Berninger and collaborators (Berninger & Swanson, 1994; Berninger et al., 1996; Whitaker et al., 1994), this finding suggests that preplanning has already emerged in Grade 4 and continues to develop throughout the next school years. Nonetheless, it is worth mentioning that in Berninger and colleagues' studies and ours the experimental procedure forced students to preplan. Hence, we cannot assume that they would do it in the absence of such instruction. Indeed, in the latter situation, 85% of sixth graders and 67% of eight graders did not show explicit planning processes (Fidalgo, Torrance, & García, 2008; Torrance et al., 2007).

Confirming Hypothesis 2, students' ability to revise increased from one grade to the next. Still, the pace of development was more pronounced for mechanical than substantive revision. Respectively, there was a growth of 3.5 and 1.6 points, from Grade 4 to 9, even though the performance of older students in revising substantive errors was poor. This result might be explained by a biased conception of revision toward surface features (Graham et al., 1993), or it might have been the by-product of indicating errors' location. It has been shown that this procedure lead seventh graders to focus on mechanical problems, at the expense of meaning problems (McCutchen et al., 1997).

The finding that students were better at correcting than detecting either mechanical or substantive errors corroborated Hypothesis 3. At all grade levels, students were able to correct more errors than those they were able to detect. In line with the findings of Hacker, Plumb, Butterfield, Quathamer, and Heineken (1994), this result suggests that writers may have difficulties in detecting an error if they are not able to recognize the correct version of it. With a sample of high school students, they showed

that the majority of detected errors were corrected. However, especially in the case of meaning errors, students' were able to correct several errors that had not been previously detected. This difference might have been magnified because in the correction task students were cued by the indication of error location, but in the detection task they were not. Probably, if this latter have been cued (e.g., by providing the number of errors or delimiting their location) the difference between the two revision sub-processes would be reduced. Nevertheless, the superiority of correction over detection is a consistent finding in the literature. Despite that, students' ability to detect errors can be improved by several means, such as instruction in the revision process (Fitzgerald & Markham, 1987), promotion of comprehension monitoring (Beal, Garrod, & Bonitatibus, 1990), or postponement of the revision process (Chanquoy, 2001).

It is noticeable that besides the growth pattern of planning and revising skills some decreases and stationary periods were found from Grade 4 to 5, and from Grade 6 to 7. This might be the consequence of the transitions between the Basic Education Stages of the Portuguese school system (see method's section). These transitions are usually accompanied by increases in teachers' expectations and learning demands (Reis et al., 2009), which can possibly defeat and weaken students' confidence on their academic skills. In the specific case of writing, it is likely that this lower sense of self-efficacy could negatively impact their performance. Indeed, it was shown that students' self-perceptions of their own writing competence is a strong predictor of various writing outcomes, above and beyond other motivational variables (Pajares & Valiante, 1997, 1999).

The regression analyses used to test if students' high-level writing skills had an incremental effect on their writing quality verified Hypothesis 4. As expected, high-level writing skills did not predict writing quality in Grades 4-6, but they did in Grades 7-9. Given the poorly developed planning and revising skills of younger students, they might have adopted a knowledge-telling strategy to write the story. With this strategy, text production is guided by topic and genre cues with little influence of high-level processes (Bereiter & Scardamalia, 1987). The early acquisition of the narrative schema enables students to write by retrieving content, filling it within the narrative schema, and translating it into text (Olive, Favart, Beauvais, & Beauvais, 2009). Regarding older

students, differences in writing quality were accounted for by their planning and revising skills, above and beyond other well-known predictors. This finding indicates that older students might have adopted a knowledge-transforming strategy to write the story, which involves the articulation of translation with planning and revising (Bereiter & Scardamalia, 1987). Older students' writing called for their planning and revising skills, respectively, to generate and organize ideas in a coherent way, and to change these ideas in an attempt to clarify them to the audience.

It is noteworthy that, with respect to revision, only substantive correction contributed to writing quality. On the one hand, it seems that writing quality is dependent upon writers' ability to focus on overall concerns at the text-meaning level, rather than on local concerns at the sentence and word levels. Indeed, it was shown that an increase in the amount of meaning, global revisions resulted in gains in compositional quality (De La Paz et al., 1998), but an increase in the amount of surface, local revisions did not (Graham, 1997). On the other hand, the finding that substantive correction, rather than substantive detection, influenced the quality of students' texts might be explained by their poor ability to detect meaning errors. Yet, this is not to say that one of the sub-processes is more important than the other. Actually, writers must be able to detect not only flaws in the text but also elements that can be enhanced through rereading. Without this recognition, writers will not be able to introduce modifications that improve the text.

The presented findings should be considered in view of at least three limitations. First, the development of planning and revising skills was analysed cross-sectionally. Future research should explore the development of these skills longitudinally. Second, students in Grades 4-6 were grouped as well as students in Grades 7-9. Besides age was introduced as a control predictor, larger samples should be collected to analyse the contribution of high-level writing skills to writing at each grade level. Third, we did not analyse the online management of planning or revision. This analysis could deepen our understanding about students' use of these skills during text production as writing performance is also influenced by the interaction and temporal distribution of planning and revision in a writing session (Rijlaarsdam & Van den Bergh, 2006).

Educational Implications

With respect to the teaching and learning of writing, the current study agrees with the position of many writing researchers that more needs to be done to support and foster the writing skills of school-aged children (e.g., Connelly & Barnett, 2009; Graham, Gillespie, & McKeown, 2012; Rijlaarsdam et al., 2005). In particular, our results complement a large body of research (see Graham & Harris, 2009), by emphasizing the importance of fostering students' high-level writing skills throughout schooling.

We found that planning and revising progressively increased across schooling, which seems to indicate that school instruction supports their development. Even so, our findings suggest that there is room for improvement. Signalling the need to develop and test instructional programs to supplement writing instruction in the general education classroom, we found that students' ability to plan before writing and to revise for meaning was not fully operational. This is problematic because these skills are critical in writing. Actually, planning and revising contributed to writing quality above and beyond a set of writing- and non-writing-related variables (viz., gender, school achievement, age, handwriting fluency, spelling, and text structure). The incremental validity of these high-level writing skills points out to the need of boosting them as a key way to improve developing writers' text production effectively and efficiently. The finding that these skills are predictive of writing quality in Grades 7-9 but not in Grades 4-6 makes us argue that they should be targeted in the initial stages of learning to writing. The lack of sufficient planning and revising abilities may, perhaps, explain why younger students are not using them in a manner that would aid text production. Nevertheless, the poorly developed high-level writing skills of novice writers do not seem to be only a question of maturation of executive functions. They might also sign that younger students are not benefiting from appropriate instruction. Consequently, efforts should be made to develop and provide teachers with evidence-based practices that they can use to support very young writers' planning and revising skills. Research has been providing evidences that not only older but also younger students can be successfully taught to employ their high-level writing skills to write qualitatively better texts. In a meta-analysis of writing instruction for students in Grades 1-6, Graham, McKeown, et al. (2012) found that the teaching of planning and revising strategies is

among the most effective writing interventions. A similar result was found in another meta-analysis with students in Grades 4-12 (Graham & Perin, 2007). Collectively, these findings and those of the present study highlight that, among the plethora of skills involved in writing, those of planning and revision deserve a prominent place in writing instruction from early on.

STUDY 3

TEACHING PLANNING OR SENTENCE-COMBINING STRATEGIES

EFFECTIVE SRSD INTERVENTIONS AT DIFFERENT LEVELS OF WRITTEN COMPOSITION

Published manuscript:

Limpo, T., & Alves, R. A. (2013). Teaching planning or sentence-combining strategies: Effective SRSD interventions at different levels of written composition. *Contemporary Educational Psychology, 38*, 328-341. doi: 10.1016/j.cedpsych.2013.07.004

Given the importance of writing in present-day knowledge societies, it is of the utmost importance to develop evidence-based practices that promote students' writing performance (Graham, Gillespie, et al., 2012). Based on multiple sources of information, Graham and Harris (2009) proposed that teaching planning and sentence-combining strategies are effective instructional practices in writing instruction. Nevertheless, little is known about the specific effects and comparative merits of planning and sentence-combining instruction. This was the main purpose of the present study, which examined the effectiveness of two strategy-focused interventions aimed at improving opinion essay writing in Grades 5-6 (age 10-12). One of the programs taught students a strategy to plan opinion essays, while the other program taught them a strategy to combine sentences. Self-regulation procedures to manage these writing strategies were embedded in both programs following the Self-Regulated Strategy Development (SRSD) model (Harris & Graham, 1996, 2009), which was adapted to the Portuguese culture and school system.

Writing Development and Strategy Instruction

The development of expertise in writing is a long and demanding process, heavily dependent upon changes in four areas: skills, strategies, knowledge, and motivation (Alexander et al., 1998; Graham, 2006b). To produce a text, writers need sentence generation skills to transform their ideas into language representations, as well as transcription skills (i.e., spelling and handwriting) to transform those representations into written text (Berninger et al., 1992). Given the complexity of the writing process, text production also demands strategic processing (Pressley & Harris, 2006). Writers must rely on a repertoire of strategies to accomplish key cognitive processes (e.g., planning or revising) and to self-regulate their use. Moreover, writers need to access their long-term memory to retrieve content knowledge as well as discourse knowledge, which includes knowledge about intended audience, different genres, tasks schemas, and linguistic conventions (McCutchen, 1986, 2011). Another critical ingredient in

writing achievement is motivation, which comprises writers' will to engage in writing along with their own representations as writers (Boscolo & Hidi, 2007). In particular, self-efficacy seems to be one of the strongest predictors of writing performance (Pajares, 2003).

Despite the importance of these four components in writing development, they are not fully operational in developing writers. In Grades 4-6 (age 9-12), transcription skills represent a strong constraint to writing, indicating that they are not completely automatic (Graham et al., 1997; Limpo & Alves, 2013a). Because of the heavy demands of these skills, students may have few attentional resources for self-regulatory processes (McCutchen, 1996). Bereiter and Scardamalia (1987) have proposed that youngsters cope with these challenges by engaging in knowledge telling: They compose text by retrieving content that is immediately written down. Their writing is mostly driven by what they know about the topic and how this can be fitted within genre constraints. This presumably effortless way of composing reflects poor strategic competence to deliberately activate and articulate key cognitive processes. Indeed, in Grades 4-6, Limpo and Alves (2013a) found that planning and revising tend to play a minimal role not only in writing performance, but also in self-efficacy judgments. On the contrary, it was students' transcription ability that strongly influenced both their performance and self-efficacy in writing. Besides developing writers' skills, strategic behavior, knowledge, and motivation seem to increase with age and schooling, these components can be enhanced through appropriate instruction (Graham, 2006b).

Strategy instruction is a type of cognitive-oriented writing intervention, which aims to enhance conscious, goal-directed, and effortful processing in writing (Pressley & Harris, 2006). For that purpose, strategy instruction provides students with explicit and systematic teaching of strategies to accomplish writing-specific processes, such as planning, sentence generation, and revising. These strategies contain the procedural or the "how to" knowledge for carrying out a particular writing process. Usually, one way of promoting the memorization of strategy steps is the teaching of mnemonics (e.g., the PLANS strategy tells students that to plan a text they need to: Pick goals, List ways to meet goals, And, make Notes, and Sequence notes; Harris et al., 2008). A common feature of different models of strategy instruction is the inclusion of self-regulation components, which are critical for facilitating strategic behaviors in writing (Alexander

et al., 1998). These components promote not only the acquisition of the learned strategies but also their maintenance and generalization. Several meta-analyses indicated that strategy instruction is one the best teaching practices to promote writing quality in Grades 2–12 (Graham, McKeown, et al., 2012; Graham & Perin, 2007; Rogers & Graham, 2008). In particular, the SRSD seems to be the most effective strategy instruction model, as its average effect size doubles that of the other ones.

The asset of SRSD over other approaches to strategy instruction is that it was designed to address the four critical ingredients of writing development: skills, strategies, knowledge, and motivation (Harris & Graham, 1996, 2009). Across six instructional stages (develop background knowledge; discuss it; model it; memorize it; support it; and independent performance) SRSD provides explicit teaching of writing strategies combined with self-regulation procedures to regulate strategies usage and writing behavior. In a meta-analytic review of true- and quasi-experimental studies examining SRSD effectiveness, Harris et al. (2009) (see also Graham, 2006a; Graham & Harris, 2003) reported average effect sizes of 1.20 and 1.23 for writing quality at posttest (n = 15) and maintenance (n = 9), and 1.20 for generalization to untaught genres (n = 5). Besides writing quality, meaningful and lasting effects of SRSD had also been reported for other aspects of writing, such as, schematic structure (e.g., inclusion of genre-specific elements), approach to writing (e.g., time spent planning and writing), discourse knowledge, and self-efficacy beliefs. It is noteworthy that these improvements were observed across achievement level, grade level, cognitive process taught, target genre, and type of instructor (teacher or researcher).

Why Teach Strategies for Planning and Sentence Generation?

Planning, which is the generation and organization of ideas along with the formulation of goals for the task, is a critical ingredient in skilled writing (Hayes & Flower, 1980). Beauvais, Olive, and Passerault (2011) found that the longer the prewriting pause and planning time of undergraduates, the better the quality of their argumentative texts. However, beginning and developing writers barely engage in preplanning activities (Bereiter & Scardamalia, 1987; McCutchen, 2006). For instance, Torrance et al. (2007) showed that, before writing, only 16% of sixth graders engaged in preplanning. Furthermore, during writing, they only spent 11% of their writing time

thinking about content. In line with these findings, Limpo and Alves (2013a) found that planning complexity did not contribute to writing quality in Grades 4-6 (age 9-12), but it did in Grades 7-9 (age 12-15). The authors suggested that, albeit being able to plan upon request, younger students lacked sufficient planning abilities to create a plan that could aid them to compose the text. Nonetheless, there is strong evidence that teaching strategies to plan ahead of writing is an effective way to promote young students' writing performance (Glaser & Brunstein, 2007; Graham, Harris, & Mason, 2005; Harris et al., 2006; Torrance et al., 2007; Wong, Hoskyn, Jai, Ellis, & Watson, 2008). To enhance novice writers' planning abilities is critical because preplanning may help them to generate content and to create an organized structure for their compositions. In addition, the plan may function as an external memory where children store ideas to include in the text and outline action-plans to produce it (Graham & Harris, 2007; but see Kellogg, 1988). Consequently, the planning time during writing might be reduced, enabling students to focus on other writing processes, such as translation (Kellogg, 1988).

Translation refers to a foundational writing process through which writers transform their thoughts into written language (Hayes & Flower, 1980). The ability to construct syntactically correct and complex sentences is, therefore, a critical translating skill that characterizes expert writing (Beers & Nagy, 2009; Berninger, Nagy, & Beers, 2011). Improving young writers' sentence-construction skills is likely to boost writing expertise in several ways (Saddler, 2007; Saddler & Asaro, 2008). The acquisition of fluency in sentence construction may free up attentional resources, so that students can concentrate on other aspects of composing, such as planning (Fayol, 1999; McCutchen, Covill, Hoyne, & Mildes, 1994). Moreover, students' with superior sentence-construction skills may have access to an enlarged syntactical repertoire for creating sentences, which not only facilitates translation (Hayes & Flower, 1986) but also set the stage for revision (Saddler & Graham, 2005). Additionally, the use of well-crafted, syntactically correct sentences may result in interesting and readable texts. An instructional method that provides direct practice with sentence-construction skills is sentence-combining (Saddler, 2007; Strong, 1986, 1996). Through sentence-combining exercises, students learn to transform basic sentences, such as "I think we should have homework" and "Homework helps us to study" into a more syntactically complex

sentence, such as “I think we should have homework because it helps us to study”. These exercises require that students manipulate sentences to create new syntactic structures preserving the original meaning. Evidence has been accumulated on the effectiveness of this approach to enhance syntactic complexity and overall compositional quality (Saddler, Behforooz, & Asaro, 2008; Saddler & Graham, 2005; for reviews and meta-analyses, see also Andrews et al., 2006; Graham & Perin, 2007; Hillocks, 1986).

Why Teach Self-Regulation Procedures?

The complexity and cognitive demands of the composing process explains why skilled writing requires high levels of self-regulation (Graham & Harris, 2000). Self-regulation refers to the degree to which students are metacognitively, motivationally, and behaviorally strategic regulators of their own writing process (Zimmerman, 1995). Besides writers can use several self-regulation procedures (for a comprehensive list, see Zimmerman & Risemberg, 1997), particularly, goal setting, self-monitoring, self-reinforcement, and self-instructions seem to be important (Bandura, 1969; Harris et al., 2008).

As writing is a goal-directed activity (Hayes & Flower, 1986), goal setting is a critical component of effective text production by serving a self-regulatory function (Locke, Shaw, Saari, & Latham, 1981; Zimmerman, 2009). The formulation of specific, proximal, and challenging goals provides clear information about task requirements and directs attention towards them. Also, it motivates the use of strategies to achieve goals, mobilizes effort, and increases persistence. Goal-setting procedures seem to be very effective in promoting writing quality (Graham & Perin, 2007), especially, when coupled with progress feedback (Schunk & Swartz, 1993). Students can track progress in achieving goals on their own through self-monitoring. First, they determine whether or not a target behavior has occurred and, then, they register the results (Nelson & Hayes, 1981). This procedure allows students to become aware of and responsible for their behavior (Mace, Belfiore, & Hutchinson, 2001; Rankin & Reid, 1995). Furthermore, it conveys to students that they are capable of meeting their goals, which may increase feelings of self-satisfaction and trigger self-administration of rewarding consequences (Bandura, 1969; Zimmerman, 2000). Self-consequences, such as self-

reinforcement, enhance motivation and efforts to improve. Importantly, students can instruct themselves to set goals, self-monitor performance, and self-reinforce success by means of explicit self-instructions (Meichenbaum, 1977; Schunk, 2001). This form of self-speech enables writers to support and guide their behavior throughout the writing process.

The development of these four self-regulation procedures via explicit teaching and support seems to be one of the key features of SRSD. In a well-designed study, Glaser and Brunstein (2007) showed that teaching writing strategies combined with self-regulation practices was more effective than teaching writing strategies alone (see also Brunstein & Glaser, 2011).

The Present Study

The primary purpose of this study was to examine and compare the effectiveness of planning and sentence-combining interventions in Grades 5-6. Following the SRSD model, both programs taught a writing strategy in combination with self-regulation procedures (viz., goal-setting, self-monitoring, self-reinforcement, and self-instructions). While one of the programs taught a strategy for planning opinion essays, the other one taught a strategy for combining sentences in opinion essay writing. The two interventions only differed on the taught writing strategy and everything else was held constant (e.g., program and lessons structure, self-regulation and instructional procedures, and number of writing tasks, including writing prompts). Meta-analyses findings showed that planning instruction lead to greater effect sizes than sentence-combining instruction (Graham & Perin, 2007; Rogers & Graham, 2008). Nevertheless, some caution is needed when interpreting these results. First, planning instruction frequently includes the teaching of self-regulation procedures, which is not the case of sentence-combining instruction. Second, interventions effects are usually compared regarding general, rather than specific, outcomes (e.g., writing quality). The present study aims to provide a more direct and controlled comparison of planning and sentence-combining interventions, which to the best of our knowledge has not been made.

We used the SRSD model in both planning and sentence-combining instruction, which allowed a fair comparison between the two interventions. Notably, this is the first study to couple SRSD with sentence-combining instruction. The development and evaluation of such an integrated instructional program is an important contribution to move forward both the SRSD and the sentence-combining literature. Given the value added impact of this model to writing instruction, the testing of how it can be effectively used to teach different skills in writing is a matter that still needs investigation. Although there is strong evidence that SRSD is effective to enhance planning skills, it has not been used to teach sentence-construction skills (Harris & Graham, 2009). Besides, there are only a few studies evaluating sentence-combining practices and none have taught self-regulation procedures to aid students in the production of sentences. As research has been demonstrating the effectiveness of both SRSD and sentence combining, the integration of these two forms of instruction seems a potentially sound instructional practice.

Furthermore, we have compared interventions effectiveness at three levels of written language (viz., discourse, sentence, and word). While planning instruction mainly taps discourse-level writing, sentence-combining instruction mainly taps sentence- and word-level writing. It is possible that holistic measures, such as overall quality, are not sufficiently sensitive to discriminate instructional effects between these levels. The present study aims to provide a detailed comparison of the two interventions by testing specific effects on the target level and transfer effects across levels. Such a fine-grained analysis may provide helpful information to closely align writing instruction with students' writing needs.

Hypotheses

Before, in the middle (after Lesson 5), and after instruction (after Lesson 12), students planned and wrote an opinion essay, and completed a sentence-combining exercise. Intervention effects on writing were assessed on strategy-specific skills, writing performance, and levels of writing. Instructional effects on these three sets of measures are described next and were expected to emerge at posttest. As students did not write complete texts until midtest, only strategy-specific effects were expected there.

Planning and sentence-combining students were expected to improve the strategy-specific skills that were explicitly taught (viz., planning or sentence combining). Moreover, they were expected to write better and longer opinion essays than control students. These predictions stem from several studies indicating that strategy instruction combined with SRSD procedures is a highly effective practice in increasing the effectiveness of strategy usage, and the quality and length of texts produced (for reviews, see Graham, 2006a; Graham & Harris, 2003; Harris et al., 2009). In the present study, besides the systematic instruction in key writing processes, students received explicit teaching and scaffolded practice in a set of self-regulation procedures. By facilitating the strategic processing characteristic of skilled writers, both SRSD interventions should lead to meaningful gains in the quality and quantity of students' writing.

To provide a more fine-grained analysis of interventions effectiveness, students' opinion essays were analyzed at three levels of written language (Wagner et al., 2011; Whitaker et al., 1994). At the discourse level, we analyzed the inclusion of functional essay elements and coherence. At the sentence level, we analyzed the use of cohesion devices (Favart, 2005), and syntactic complexity via clause length (Beers & Nagy, 2009 showed that clause rather than T-unit length was related to opinion essay quality). At the word level, we analyzed vocabulary diversity and use of modifiers. The two strategy interventions were expected to have different effects on these levels. On the one hand, we predicted that planning students would outperform their peers at the discourse level because they learnt a strategy to generate and organize ideas in a complete and coherent essay. Reviews of intervention studies have shown that this type of instruction increases the number of genre-specific elements included in texts (Graham, 2006a; Graham & Harris, 2003; Harris et al., 2009). On the other hand, we expected that sentence-combining students would outperform their peers at the sentence and word levels because they learnt a strategy to write syntactically complex sentences with cohesion devices, diverse vocabulary, and modifiers. After sentence-combining instruction, non-SRSD studies have reported increases not only in the number of connectives used in writing (Saddler et al., 2008) but also in the number of sentences combined through revision (Saddler & Graham, 2005). By incorporating sentence combining into the

SRSD framework, we expected extensive improvements in students' writing at the sentence- and word-levels.

To examine instructional effects on motivation, at pretest and posttest, students filled out a self-efficacy scale. Even though some SRSD interventions failed to increase writing self-efficacy (Graham et al., 2005; Page-Voth & Graham, 1999; Sawyer, Graham, & Harris, 1992; but see Brunstein & Glaser, 2011), the use of self-regulation strategies is thought to increase students' beliefs about their capabilities (Pajares, 2003; Schunk, 2003; Zimmerman, 2000; Zimmerman & Risemberg, 1997). In the present study, the combination of goal setting with self-monitoring plus self-reinforcement was used to strength the link between strategy usage and enhanced performance, as well as to highlight students' progress over instruction. This should lead to an increase in their perceptions as competent writers. On this ground, we predicted that both SRSD interventions would increase students' self-efficacy for writing.

Finally, to examine generalization effects of the interventions, students summarized a text before and after instruction. The generalization measure of summary writing was chosen because it enabled us to assess the transfer of strategies' core principles rather than the use of memorized routines (Shepard, 2000). Strategies transfer from opinion essay to summary writing should be facilitated by the SRSD. This model provides students critical self-regulatory tools to flexibly apply the learned knowledge and strategies to other writing tasks (Harris & Graham, 2009; Harris et al., 2009). We predicted that the teaching of a planning strategy to select and organize self-generated information would increase these students' ability to select relevant information to include in their summaries. We further anticipated that the teaching of a sentence-combining strategy would increase students' propensity to condense different ideas from the original text into single sentences in the summary.

Method

Participants and Design

Participants were 146 Portuguese native speakers in Grades 5-6 (3 classes per grade) from a public school located in an urban district in Northwest Portugal. Twenty students were excluded from the analyses based on one or more of the following

criteria: absence in a testing session (12 students), absence in two or more lessons (4 students), and special education needs (5 students). Subsequent analyses were based on the data from 126 students. The study involved a pretest, midtest, posttest quasi-experimental design with three conditions: planning, sentence combining, and control. Within each grade level, each intact class was randomly assigned to one of the three conditions. Demographic data by condition is provided on Table 1.

Table 1
Demographic data for the participating students by condition.

Measure	Condition		
	Planning	Sentence Combining	Control
Grade (*N*s)			
Fifth	24	20	25
Sixth	24	19	14
Gender (*N*s)			
Girls	27	15	20
Boys	21	24	29
Age (in years)			
M (*SD*)	11.2 (0.7)	11.1 (0.6)	11.2 (0.6)
Min-Max	10.2–13.7	10.2–12.6	10.1–12.6
Mother's educational level (%)			
Grade 4 or below	4	10	5
Grade 9 or below	15	18	31
High school	44	46	28
College or above	31	21	26
Unknown	6	5	10
School marks (1-5)			
$M_{Portuguese}$ (*SD*)	3.6 (0.9)	3.5 (1.0)	3.1 (0.8)
$M_{Mathematics}$ (*SD*)	3.7 (0.8)	3.7 (1.1)	3.3 (0.9)

Note. For school marks, 1 = *lowest score* and 5 = *highest score*.

Intervention Conditions

Students' Portuguese language teacher delivered writing instruction. Two teachers implemented each intervention program. The four female teachers (*M* age = 50.3 years, *SD* = 8.5) had a teaching experience of more than 16 years (*M* = 22.5 years, *SD* = 6.0). Writing instruction occurred during Portuguese language classes, in 12 weekly lessons of 90 min. In line with the SRSD model (Harris & Graham, 1996, 2009), students were taught a writing strategy in tandem with self-regulation

procedures. The following practices were used: development of knowledge for writing and self-regulation; explicit instruction, discussion, and modeling of the target strategy and self-regulation procedures; promotion of the mnemonic and self-instructions memorization; collaborative practice supported by teachers and guidance materials that were gradually faded; independent practice with teacher monitoring and support when needed.

Writing strategies. Both intervention groups learned a writing strategy, along with the necessary skills and knowledge to properly use it. In the planning condition, students were taught a strategy to plan opinion essays. They learned the mnemonic CRÊS, which stands for: tell what you believe, give 3 or more reasons, explain each reason, and wrap it up. This is the Portuguese adaptation of the mnemonic TREE (Harris et al., 2008). The strategy was practiced in isolation during the first five lessons. Then, it was embedded in text production.

In the sentence-combining condition, students were taught a strategy to combine sentences. We developed the mnemonic DICA that is the Portuguese acronym to: what do you want to say?, what is the idea (addition, contrast, or cause)?, choose the best connective, and enrich with adjectives and adverbs. During the first five lessons students performed sentence-combining exercises, which evolved from highly cued to uncued. Then, they started writing opinion essays. In accordance with Strong (1986), three procedures were used to promote transfer of sentence-combining skills from exercises to composition. First, we used whole-discourse exercises, that is, the sentences within an exercise formed an opinion essay. Second, students learned opinion markers to help them to organize the sentences within the essay. Third, students were provided explicit instruction and guided practice to integrate DICA into composition.

Self-regulation procedures. These procedures were introduced in a stepwise fashion and similarly across intervention conditions. *Goal setting* was introduced in Lesson 1. Students had a general goal (viz., to write good opinion essays) plus strategy-specific goals. Planning students had to write complete opinion essays, while sentence-combining students had to write well-crafted sentences with connectives, opinion markers, and adjectives/adverbs. *Self-monitoring* was introduced in Lesson 2. Students were given a "self-monitoring sheet" where they: (a) set the goal for the task, (b) registered and counted the number of essay parts (planning condition), or the number of

connectives, opinion markers, and adjectives/adverbs (sentence-combining condition), and (c) wrote a self-reinforcement statement. They were also given a "progress sheet" to register and track their performance during instruction. *Self-instructions* were introduced in Lesson 3. Using a "writing flowchart" students developed self-instructions to set goals, use the strategy, and check if goals were met.

Lessons summary. In Lesson 1, students discussed the importance of planning or constructing well-crafted sentences, respectively, in planning and sentence-combining condition. The target strategy was introduced in Lesson 2. Using the self-monitoring and progress sheets, planning and sentence-combining students had to find and register the essay parts or connectives included in an exemplar opinion essay, and, then, in their own pretest essays. From this session on, they filled out the progress sheet anytime they worked individually.

Lessons 3-5 involved modeling of strategy implementation followed by collaborative and independent practice. In Lesson 3, teachers modeled how to use the strategy and, after discussing it, students came up with their self-instructions. In Lesson 4, the class emulated the teacher modeling and repeated it at home. In Lesson 5, they applied the writing strategy, individually.

Lessons 6-8 involved modeling of writing strategy integration within text production followed by collaborative and independent practice. In Lesson 6, the teacher modeled how to use the strategy in writing. Then, students came up with updated self-instructions. In Lesson 7, the class emulated the teacher modeling. In addition, teachers prompted strategies transfer to different situations. In Lesson 8, students wrote their first opinion essay, individually.

In Lesson 9, each teacher grouped students that faced similar difficulties and gave them individualized feedback. Lessons 10 and 11 involved independent practice in opinion essay writing with minimal support. In Lesson 12, students examined and discussed their progress sheet.

Treatment fidelity. Five procedures guaranteed that both interventions were delivered as intended. First, teachers participated in an 8-hr pre-intervention workshop, in which they were introduced to the writing strategies and self-regulation procedures to be taught. They also received the instructional manuals and discussed lessons' procedures. Second, teachers had weekly meetings with the first author to practice the

next lesson and to discuss the previous one. Deviations from instructional plans were rare and usually involved missed steps. Third, teachers were provided with a checklist with all lessons' steps and they were asked to check them off when completed. Teachers of both strategy conditions completed 98% of the proposed steps. Whenever possible, missed steps were addressed in the next lesson. Fourth, the first author observed one third of the lessons and filled out the same checklist as the teachers. Planning and sentence-combining teachers completed 97% and 96% of the proposed steps, respectively. Fifth, the quality of these observed lessons was evaluated on five items: (a) level of students' engagement, (b) students' responses to questions and participation in discussion, (c) teachers' responses to students' questions, (d) efficiency of instruction, and (e) pacing of instruction (based on Saddler & Graham, 2005). The average quality for planning and sentence-combining instruction was 3.7 and 3.6, respectively (0 = *very low*; 4 = *very high*).

Control Condition

Writing instruction of control students followed the standard writing curriculum and was delivered by their regular Portuguese language teachers, not implementing the interventions. After instruction, the two teachers were interviewed to determine their approach to the teaching of writing. They reported to allot between 45 and 90 min to writing instruction weekly. This writing time was predominately devoted to grammar instruction and to independent text production. The teaching of grammar was based on traditional whole-class teaching methods. Teachers made no references to the use of sentence combining. Regarding text production, they reported to use the process approach that was recently included in the Portuguese language curriculum (Reis et al., 2009). Nevertheless, no references were made to the explicit and systematic teaching of either writing strategies or self-regulation procedures to accomplish specific writing processes. In sum, writing instruction delivered to control students greatly differed from the one delivered to intervention students. Additionally, control students were asked to write the same number of opinion essays and on the same topic as the other students.

Testing Sessions

One week before and after instruction all students completed a pretest and a posttest, respectively. Testing sessions occurred in regular classroom groups and lasted 90 min. Students started by filling out a self-efficacy scale (Pajares & Valiante, 1999). Then, the experimenter presented the opinion essay topic (pretest: "Do you think teachers should give homework every days?"; and posttest: "Do you think children should work out every days?"), and gave students a blank sheet, in which they could write everything that would help them to write the essay (for a similar procedure see Berninger et al., 1996). Students had 8 min to plan the text and 16 min to write it. Afterwards, students did a sentence-combining exercise, in which they combine four pairs of kernel sentences into a syntactically correct sentence. Lastly, students summarized a text. Only at posttest, intervention students filled out a scale to assess social validity.

After Lesson 5, all students completed a 60-min midtest. With a similar procedure to pretest and posttest, they were asked to plan and write an opinion essay ("Do you think children should go to bed early every days?") and to perform a sentence-combining exercise.

Measures

Except writing quality and variables calculated with the Computerized Language Analysis software (CLAN; MacWhinney, 2000), all other measures were scored by the first author. A second judge rescored one third of the measures at each testing time.

Strategy-specific measures. The developmental maturity of students' *planning* behavior was measured with a scale ranging from 1 (*low*) to 6 (*high*), which was based on the scales of Whitaker et al. (1994) and Olinghouse and Graham (2009). The scores 1 and 2 were attributed to plans representing no and minimal preplanning, respectively. Plans summarizing the text received a score of 3, and plans with topics slightly elaborated in the text received a score of 4. The scores 5 and 6 were attributed to plans with emergent subordination (i.e., rudimentary macrostructure) and structural relationships (e.g., graphic organizers), respectively. At pretest, midtest, and posttest, inter-rater reliability using Cohen's weighted Kappa, was .87, .81, and .82, respectively. *Sentence-combining* skills were measured with a four-item exercise. For each item, one

point was awarded if the student produced a syntactically correct sentence. An extra point was awarded if the sentence also included relevant changes that improved the quality of the original sentences (e.g., use of pronouns). The final score was the sum of the points awarded per item (max = 8). At pretest, midtest, and posttest, inter-rater reliability using Cohen's weighted Kappa was .95, .91, and .94, respectively.

Writing performance measures. Two measures were obtained from students' opinion essays: writing quality and text length. Two graduate students, blind to study purposes, assessed *quality*. To avoid biased judgments all texts were previously typed and corrected for spelling, punctuation, and capitalization errors (Berninger & Swanson, 1994). Using a scale ranging from 1 (*low*) to 7 (*high*), judges rated ideas quality, coherence, syntax, and vocabulary. The average across these factors was calculated for each rater. At pretest, midtest, and posttest, inter-rater reliability using the Intraclass Correlation Coefficient (ICC) was .95, .96, and .96, respectively. The final quality score was the average across raters. CLAN was used to obtain the number of words in the essays (*text length*).

Discourse-level measures. Opinion essays were scored for the presence and elaboration of four functional essay elements: premise, reasons, elaborations, and conclusion (based on Harris & Graham, 1996). Information off-topic or with no rhetorical purpose was rated as non-functional. For *premise* and *conclusion*, it was awarded one point if they were present, and two points if they were present and elaborated. For *reasons*, one point was awarded for each unique reason justifying the premise. For *elaborations*, one point was awarded for each reason explained in depth (e.g., use of examples). At pretest, midtest, and posttest, inter-rater reliability of these measures using Cohen's weighted Kappa was greater than .75, .78, and .75, respectively. We also calculated *coherence* by dividing the number of functional elements by the number of functional plus non-functional elements.

Sentence-level measures. We evaluated the ratio of connective and opinion clauses, variety of connectives and opinion markers, and clause length. A clause was defined as a unit with a unified predicate and expressing a single situation (Berman & Slobin, 1994). *Ratio of connective clauses* and *ratio of opinion clauses* were calculated by dividing the number of connectives or opinion markers by the number of clauses. *Variety of connectives* and *variety of opinion markers* was obtained from the number of

different connectives or opinion markers. *Clause length* (i.e., number of words per clause) was calculated with CLAN. At pretest, midtest, and posttest, inter-rater reliability of these measures using ICC was greater than .85, .89, and .85, respectively.

Word-level measures. We measured vocabulary diversity, and ratio and variety of modifiers (viz., adjectives and adverbs with the suffix –ly). *Vocabulary diversity* was assessed with a corrected type-token ratio (Carroll, 1964), which was calculated by dividing different words by the square root of two times the total words. *Ratio of modifiers* was the proportion of modifiers to text length. *Variety of modifiers* was obtained from the number of different modifiers. At pretest, midtest, and posttest, inter-rater reliability of these measures using ICC was greater than .92, .95, and .89, respectively.

Motivational measure: Self-efficacy. Students' self-efficacy beliefs were assessed with the Writing Skills Self-Efficacy scale (Pajares & Valiante, 1999; adapted to Portuguese by Limpo & Alves, 2013a). The scale has 10 items, which measure students' confidence about being able to accomplish specific writing skills. The answers are given in a scale ranging from 0 (*no chance*) to 100 (*completely certain*). As confirmatory factor analysis on students' pretest responses showed a good fit of the data to a single-factor solution (CFI = .95, RMSEA = .09), the final score was the average across all items ($\alpha_{pretest} = .93$; $\alpha_{posttest} = .92$).

Generalization measure: Summary writing. The texts to be summarized reported an experiment showing animals' intelligence. Summaries were scored for sensitivity to importance and sentences transformation (based on Friend, 2001; Garner & McCaleb, 1985). For *sensitivity to importance*, we considered six elements: thesis, experiment description, conclusion, irrelevant ideas excluded, and misinterpretations. For the first three elements, it was awarded one point if they were present but incomplete, and two points if they were present and complete. As the stimulus text contained two irrelevant ideas, one point as awarded for each one that was excluded. We also counted the number of ideas that were misinterpretations of the original text. The final score was the total points awarded for thesis, experiment, conclusion, and irrelevant ideas excluded, minus the number of misinterpretations. At pretest and posttest, inter-rater reliability using Cohen's weighted Kappa was .83 and .83, respectively. For *sentences transformation*, one point was awarded for each syntactically correct sentence that

subsumed two or more sentences from the original text. The final score was the proportion of correct transformations by the number of sentences. At pretest and posttest, inter-rater reliability using ICC was .91 and .87, respectively.

Social validity. At the end of the study, intervention students were asked to fill out a scale to assess the perceived value of the strategies. They rated their level of agreement (1 = *strongly disagree*; 6 = *strongly agree*) with these statements: (a) The strategy helped me to write better opinion essays; (b) The strategy helped me to write better in general; (c) The strategy was difficult; (d) I will continue to use the strategy; (e) The strategy should be taught to other students; and (f) I would like to learn strategies for other genres (based on MacArthur & Philippakos, 2010).

Results

In a set of preliminary analyses, firstly, we tested if our data met the normality assumption of parametric procedures. The inspection of the skewness and kurtosis of all pretest, midtest, and posttest scores revealed no distributional problems, as the absolute values of these indexes did not exceed 3.0 and 10.0, respectively (Kline, 2005). Secondly, as students were nested within classrooms, we tested if there were differences between classrooms for all dependent measures at pretest. One-way analyses of variance (ANOVAs) showed no differences across classrooms (ps > .06), except for planning, text length, and self-efficacy. Thirdly, because our sample included fifth and sixth graders, we tested if there were differences between grades for all dependent measures at pretest. One-way ANOVAs using grade level as a between-subjects factor revealed no grade effects (ps > .13).

For planning, text length, and self-efficacy we conducted two-way nested Analyses of Covariance (ANCOVAs) with condition as a fixed factor, classroom as a random factor, and the respective pretest score as a covariate. Both at midtest and posttest, these analyses revealed no effects of classroom nested within condition (Fs < 1.27, ps > .29). Thus, for all variables, we conducted 3 x 3 (Condition [planning, sentence combining, control] x Testing Time [pretest, midtest, posttest]) ANOVAs with repeated measures on the last factor. Table 2 provides means and standard deviations for all dependent variables and Table 3 presents ANOVAs' results. Significant

Condition x Testing Time interactions were examined by means of tests of simple main effects, which are described in the text as follows. First, we report results regarding differences between conditions within each testing time. Then, we present results regarding differences between testing times within each condition. Significant simple effects were followed-up through pairwise comparisons. Table 4 reports Cohen's *d* for significant pairwise comparisons between conditions at midtest and posttest (Cohen, 1988). Because either in simple effects analysis or in pairwise comparisons we were making three comparisons at a time, to control for Type I error inflation, we used a Bonferroni adjustment with an alpha level of .017 ($\alpha = .05/3$).

Table 2
Means (and standard deviations) for all measures in each condition by testing time.

	Pretest			Midtest			Posttest		
Measure	PL	SC	CO	PL	SC	CO	PL	SC	CO
Strategy specific									
Planning	2.58	2.38	2.00	3.73	2.08	1.74	5.42	1.97	1.77
	(1.38)	(1.29)	(0.92)	(1.63)	(0.81)	(0.75)	(0.74)	(1.11)	(0.99)
Sentence combining	2.94	3.28	2.92	2.54	3.67	2.56	2.75	4.54	2.51
	(1.87)	(1.64)	(1.98)	(1.75)	(1.68)	(1.79)	(1.97)	(1.86)	(1.97)
Writing performance									
Quality	3.97	3.75	3.70	4.26	3.97	3.23	4.59	4.39	3.47
	(1.16)	(1.34)	(0.91)	(1.05)	(1.23)	(1.04)	(1.10)	(1.49)	(1.03)
Text length	99.90	67.56	80.28	118.29	93.23	63.95	131.88	116.69	67.67
	(45.96)	(34.36)	(34.78)	(37.77)	(35.65)	(38.85)	(42.50)	(33.97)	(32.09)
Adjusted *M*				110.72	102.40	66.71	126.74	124.86	68.56
Discourse level									
Premise	1.46	1.33	1.23	1.69	1.72	1.54	1.71	1.44	1.33
	(0.50)	(0.53)	(0.43)	(0.51)	(0.46)	(0.56)	(0.46)	(0.50)	(0.48)
Reasons	1.71	1.92	1.85	2.77	2.15	1.62	3.02	2.44	1.74
	(0.80)	(0.93)	(0.84)	(0.91)	(1.18)	(0.91)	(0.60)	(1.14)	(0.91)
Elaborations	0.65	0.51	0.74	1.19	0.79	0.64	1.73	0.85	0.72
	(0.64)	(0.64)	(0.55)	(0.98)	(0.83)	(0.63)	(1.13)	(0.59)	(0.72)
Conclusion	0.65	0.28	0.46	1.19	1.10	0.54	1.56	1.44	0.36
	(0.73)	(0.61)	(0.68)	(0.87)	(0.82)	(0.76)	(0.74)	(0.75)	(0.67)
Coherence	0.85	0.87	0.89	0.93	0.91	0.93	0.96	0.89	0.87
	(0.15)	(0.13)	(0.14)	(0.11)	(0.12)	(0.13)	(0.07)	(0.11)	(0.15)
Sentence level									
Ratio of connective clauses	0.42	0.48	0.44	0.48	0.49	0.44	0.47	0.48	0.47
	(0.18)	(0.22)	(0.16)	(0.17)	(0.16)	(0.23)	(0.14)	(0.13)	(0.19)

(*table continues*)

Table 2 (*continued*)

	Pretest			Midtest			Posttest		
Measure	PL	SC	CO	PL	SC	CO	PL	SC	CO
Sentence level									
Variety of connectives	3.19 (1.18)	2.79 (1.20)	2.87 (1.03)	3.31 (1.15)	3.72 (1.12)	2.49 (1.21)	3.83 (0.86)	5.82 (2.26)	2.49 (0.76)
Ratio of opinion clauses	0.16 (0.14)	0.14 (0.11)	0.18 (0.12)	0.17 (0.09)	0.23 (0.16)	0.20 (0.15)	0.23 (0.13)	0.40 (0.14)	0.14 (0.14)
Variety of opinion markers	1.33 (0.83)	1.15 (0.84)	1.51 (0.88)	1.88 (1.10)	2.69 (1.89)	1.15 (0.63)	2.58 (1.35)	5.36 (1.40)	1.13 (0.83)
Clause length	6.70 (1.19)	6.26 (1.30)	6.77 (1.12)	6.69 (1.11)	7.00 (1.37)	6.60 (1.27)	6.21 (0.82)	7.22 (1.16)	6.21 (1.19)
Word level									
CTTR	4.43 (0.71)	4.10 (0.73)	4.11 (0.64)	4.46 (0.60)	4.54 (0.67)	4.03 (0.65)	4.53 (0.75)	4.90 (0.67)	4.16 (0.63)
Ratio of modifiers	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.03 (0.02)	0.03 (0.03)	0.04 (0.03)	0.05 (0.02)	0.04 (0.03)
Variety of modifiers	1.69 (1.68)	1.38 (1.29)	1.26 (1.19)	2.06 (1.67)	2.64 (2.24)	1.77 (2.01)	4.08 (2.43)	5.26 (2.98)	2.46 (1.85)
Self-efficacy	69.65 (17.78)	72.46 (16.79)	63.92 (26.92)	–	–	–	79.05 (14.75)	78.41 (14.72)	72.97 (21.02)
Summary									
Sensitivity to importance	3.31 (1.64)	3.46 (1.94)	3.41 (2.25)	–	–	–	4.50 (1.56)	3.36 (1.98)	3.38 (2.17)
Sentences transformation	0.12 (0.23)	0.08 (0.20)	0.07 (0.15)	–	–	–	0.14 (0.28)	0.17 (0.26)	0.14 (0.23)

Note. See Method's section for description of measures. PL = planning; SC = sentence combining; CO = control.

Strategy-Specific Measures

Planning. There were statistically significant effects for condition, testing time, and the interaction between the two. Tests of simple main effects for the interaction revealed differences between conditions at midtest, $F(2, 123) = 35.99$, $p = .001$, $\eta^2_p = 0.37$, and posttest, $F(2, 123) = 210.05$, $p < .001$, $\eta^2_p = 0.77$. At midtest and posttest, follow-up analyses showed that planning students wrote more complex plans than sentence-combining and control students (ps < .001). Tests of simple main effects also revealed differences between testing sessions for the planning group, $\Lambda = .39$, $F(2, 122) = 97.52$, $p < .001$, $\eta^2_p = 0.62$. Follow-up analyses showed that planning skills increased from pretest to midtest, and from midtest to posttest (ps < .001).

Sentence combining. There were statistically significant effects for condition and the interaction between condition and testing time. Tests of simple main effects for the interaction revealed differences between conditions at midtest, $F(2, 123) = 5.53$, $p = .005$, $\eta^2_p = 0.08$, and posttest, $F(2, 123) = 13.02$, $p < .001$, $\eta^2_p = 0.18$. At midtest and posttest, follow-up analyses showed that sentence-combining students correctly combined more sentences than planning and control students (ps < .006). Tests of simple main effects also revealed differences between testing sessions for the sentence-combining group, $\Lambda = .88$, $F(2, 122) = 8.07$, $p < .001$, $\eta^2_p = 0.12$. Follow-up analyses showed an increase in sentence-combining skills from midtest to posttest ($p = .01$).

Writing Performance Measures

Quality. There were statistically significant effects for condition, testing time, and the interaction between the two. Tests of simple main effects for the interaction revealed differences between conditions at midtest, $F(2, 123) = 9.58$, $p < .001$, $\eta^2_p = 0.14$, and posttest, $F(2, 123) = 10.03$, $p < .001$, $\eta^2_p = 0.14$. At midtest and posttest, follow-up analyses showed that planning and sentence-combining students wrote qualitatively better opinion essays than control students (ps < .004). No differences were found between planning and sentence-combining conditions. Tests of simple main effects also revealed differences between testing sessions for the planning group, $\Lambda = .91$, $F(2, 122) = 6.39$, $p = .002$, $\eta^2_p = 0.10$, and for the sentence-combining group, $\Lambda = .92$, $F(2, 122) = 5.52$, $p = .005$, $\eta^2_p = 0.08$. For both groups, follow-up analyses showed that writing quality increased from pretest to posttest ($p = .001$).

Text length. Significant differences between conditions were found for text length at pretest. Thus, treatment effects on text length at midtest and posttest were analyzed with two one-way ANCOVAs, with pretest scores as the covariate. For both analyses, we found no interactions between pretest scores and condition (ps > .19) meaning that the assumption of homogeneous regression slopes was met. The effect of condition was significant at midtest $F(2, 120) = 9.98$, $p < .001$, $\eta^2_p = 0.14$, and posttest $F(2, 120) = 4.08$, $p = .02$, $\eta^2_p = 0.06$. At both testing times, follow-up analyses revealed that planning and sentence-combining students wrote longer texts than control students (ps < .001).

Table 3

Results of the 3 (condition) x 3 (testing time) repeated measures ANOVAs.

	ME of condition	ME of testing time		Interaction		
Measure	$F(2, 123)$	Λ	$F(2, 122)$	Λ	$F(4, 244)$	η^2_p
Strategy specific						
Planning	85.38***	.78	17.39***	.45	30.16***	0.33
Sentence combining	8.37***	.97	1.74	.88	4.07**	0.06
Writing performance						
Quality	8.27***	.91	6.00**	.87	4.31**	0.07
Text length[a]						
Discourse level						
Premise	7.11***	.83	12.83***	.96	1.27	0.02
Reasons	17.43***	.80	15.41***	.76	8.88***	0.13
Elaborations	13.23***	.83	12.39***	.82	6.54***	0.10
Conclusion	23.45***	.64	35.07***	.74	10.06***	0.14
Coherence	1.56	.92	5.59**	.89	3.82**	0.06
Sentence level						
Ratio of connective clauses	< 1	.99	< 1	.99	< 1	0.01
Variety of connectives	31.57***	.67	30.04***	.59	18.36***	0.23
Ratio of opinion clauses	11.44***	.77	18.05***	.68	12.89***	0.17
Variety of opinion markers	51.26***	.41	89.52***	.36	40.22***	0.40
Clause length	2.06	.98	1.52	.83	5.78***	0.09
Word level						
CTTR	7.32***	.85	10.73***	.83	6.07***	0.09
Ratio of modifiers	3.05	.58	44.05***	.98	< 1	0.01
Variety of modifiers	8.00***	.51	59.00***	.84	5.58***	0.08
Self-efficacy[b]	1.83	.76	39.68***	.99	< 1	0.01
Summary[b]						
Sensitivity to importance	1.57	.98	3.03	.93	4.54**	0.07
Sentences transformation	< 1	.96	5.21*	.99	< 1	0.01

[a]Instructional effects were calculated with ANCOVAs (see section 3.2.2.). [b]As data was collected only at pretest and posttest, degrees of freedom for condition, testing time, and the interaction were $F(2, 123)$, $F(1, 123)$ and $F(2, 123)$, respectively. ME = main effect.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4

Effect sizes (Cohen's d) computed for statistical significant pairwise comparisons (α = .017) between conditions at midtest and posttest.

	Planning vs. Sentence Combining		Planning vs. Control		Sentence Combining vs. Control	
Measure	Midtest	Posttest	Midtest	Posttest	Midtest	Posttest
Strategy-specific						
Planning	1.28	3.66	1.57	4.18		
Sentence combining	-0.66	-0.93			0.64	1.06
Writing performance						
Quality			0.99	1.05	0.65	0.72
Text length[a]			1.15	1.55	0.96	1.70
Discourse level						
Reasons	0.59	0.64	1.26	1.66		0.68
Elaborations		0.98	0.67	1.07		
Conclusion			0.80	1.70	0.71	1.52
Coherence		0.76		0.77		
Sentence level						
Variety of connectives		-1.16	0.69	1.65	1.06	1.98
Ratio of opinion clauses		-1.26		0.67		1.86
Variety of opinion markers	-0.52	-2.02	0.81	1.29	1.09	3.68
Clause length		-1.01				0.86
Word level						
CTTR		-0.52	0.69	0.53	0.77	1.14
Variety of modifiers				0.75		1.13
Summary						
Sensitivity to importance	–	0.64	–	0.59	–	

Note. Effect sizes for premise, number of modifiers, self-efficacy, and sentences transformation were not presented because the Condition x Testing Time interaction was not significant.

[a]Effect sizes calculated from adjusted means.

Discourse-Level Measures

Premise. We found statistically significant effects of condition and testing time, but no interaction between the two. Planning students outperformed sentence-combining and control students ($p < .001$). Also, there was an increase from pretest to midtest ($p < .001$).

Reasons. There were statistically significant effects for condition, testing time, and the interaction between the two. Tests of simple main effects for the interaction revealed differences between conditions at midtest, $F(2, 123) = 14.52$, $p < .001$, $\eta^2_p =$

0.19, and posttest, $F(2, 123) = 22.03$, $p < .001$, $\eta^2_p = 0.26$. At midtest and posttest, follow-up analyses showed that planning students wrote more reasons than sentence-combining and control students (ps < .005). Only at posttest, sentence-combining students wrote more reasons than control students ($p = .003$). Tests of simple main effects also revealed differences between testing sessions for the planning group, $\Lambda = .65$, $F(2, 122) = 33.15$, $p < .001$, $\eta^2_p = 0.35$. Follow-up analyses showed an increase in the number of reasons from pretest to midtest ($p < .001$).

Elaborations. There were statistically significant effects for condition, testing time, and the interaction between the two. Tests of simple main effects for the interaction revealed differences between conditions at midtest, $F(2, 123) = 4.98$, $p = .008$, $\eta^2_p = 0.08$, and posttest, $F(2, 123) = 17.94$, $p < .001$, $\eta^2_p = 0.23$. At midtest and posttest, follow-up analyses showed that planning students wrote more elaborated reasons than control students (ps < .003). Moreover, only at posttest, planning students wrote more elaborated reasons than sentence-combining students ($p < .001$). Tests of simple main effects also revealed differences between testing sessions for the planning group, $\Lambda = .70$, $F(2, 122) = 25.81$, $p < .001$, $\eta^2_p = 0.30$. Follow-up analyses showed that the number of elaborations progressively increased from pretest to midtest, and from midtest to posttest (ps < .001).

Conclusion. There were statistically significant effects for condition, testing time, and the interaction between the two. Tests of simple main effects for the interaction revealed differences between conditions at midtest, $F(2, 123) = 7.60$, $p = .001$, $\eta^2_p = 0.11$, and posttest, $F(2, 123) = 34.16$, $p < .001$, $\eta^2_p = 0.36$. At midtest and posttest, follow-up analyses showed that both planning and sentence-combining students surpassed control students (ps < .003). Tests of simple main effects also revealed differences between testing sessions for the planning group, $\Lambda = .71$, $F(2, 122) = 24.75$, $p < .001$, $\eta^2_p = 0.29$, and for the sentence-combining group, $\Lambda = .65$, $F(2, 122) = 33.54$, $p < .001$, $\eta^2_p = 0.36$. Follow-up analyses showed that both groups' conclusion scores increased from pretest to midtest (ps < .001).

Coherence. There were statistically significant effects of testing time and the interaction between condition and testing time. Tests of simple main effects for the interaction revealed differences between conditions at posttest, $F(2, 123) = 9.38$, $p < .001$, $\eta^2_p = 0.13$. Follow-up analyses showed that planning students wrote more

coherently than sentence-combining and control students (*p*s < .001). Tests of simple main effects also revealed differences between testing sessions for the planning group, $\Lambda = .87$, $F(2, 122) = 9.29$, $p < .001$, $\eta^2_p = 0.13$. Follow-up analyses showed an increase in coherence from pretest to midtest ($p = .002$).

Sentence-Level Measures

Ratio of connective clauses. There were no statistically significant effects.

Variety of connectives. There were statistically significant effects for condition, testing time, and the interaction between the two. Tests of simple main effects for the interaction revealed differences between conditions at midtest, $F(2, 123) = 11.43$, $p < .001$, $\eta^2_p = 0.16$, and posttest, $F(2, 123) = 54.02$, $p < .001$, $\eta^2_p = 0.47$. At midtest and posttest, follow-up analyses showed that both sentence-combining and planning students wrote a wider variety of connectives than control students (*p*s < .001). Moreover, only at posttest, sentence-combining students outperformed planning students ($p < .001$). Tests of simple main effects also revealed differences between testing sessions for the sentence-combining group, $\Lambda = .48$, $F(2, 122) = 65.38$, $p < .001$, $\eta^2_p = 0.52$. Follow-up analyses showed a progressive increase in the variety of connectives from pretest to midtest, and from midtest to posttest (*p*s < .001).

Ratio of opinion clauses. There were statistically significant effects for condition, testing time, and the interaction between the two. Tests of simple main effects for the interaction revealed differences between conditions at posttest, $F(2, 123) = 35.97$, $p < .001$, $\eta^2_p = 0.37$. Follow-up analyses showed that sentence-combining and planning students wrote more clauses with opinion markers than control students (*p*s < .003). Moreover, sentence-combining students outperformed planning students ($p < .001$). Tests of simple main effects also revealed differences between testing sessions for the sentence-combining group, $\Lambda = .60$, $F(2, 122) = 40.42$, $p < .001$, $\eta^2_p = 0.40$. Follow-up analyses showed that the ratio of opinion clauses progressively increase from pretest to midtest, and from midtest to posttest (*p*s < .001).

Variety of opinion markers. There were statistically significant effects for condition, testing time, and the interaction between the two. Tests of simple main effects for the interaction revealed differences between conditions at midtest, $F(2, 123) = 13.63$, $p < .001$, $\eta^2_p = 0.18$, and posttest, $F(2, 123) = 119.05$, $p < .001$, $\eta^2_p = 0.66$. At midtest and

posttest, follow-up analyses showed that sentence-combining and planning students used more diversified opinion markers than control students (*p*s < .011). Moreover, sentence-combining students outperformed planning students (*p*s < .004). Tests of simple main effects also revealed differences between testing sessions for the sentence-combining group, $\Lambda = .26$, $F(2, 122) = 172.47$, $p < .001$, $\eta^2_p = 0.74$, and for the planning group, $\Lambda = .77$, $F(2, 122) = 18.72$, $p < .001$, $\eta^2_p = 0.24$. Follow-up analyses showed a progressive increase in the variety of connectives from pretest to midtest, and from midtest to posttest (*p*s < .007).

Clause length. There was a statistically significant interaction between condition and testing time. Tests of simple main effects for the interaction revealed differences between conditions at posttest, $F(2, 123) = 12.38$, $p < .001$, $\eta^2_p = 0.17$. Follow-up analyses showed that sentence-combining students wrote longer clauses than planning and control students (*p*s < .001). Tests of simple main effects also revealed differences between testing sessions for the sentence-combining group, $\Lambda = .89$, $F(2, 122) = 7.52$, $p < .001$, $\eta^2_p = 0.11$. Follow-up analyses showed that the number of words per clause increased from pretest to midtest ($p = .005$).

Word-Level Measures

Vocabulary diversity. There were statistically significant effects for condition, testing time, and the interaction between the two. Tests of simple main effects for the interaction revealed differences between conditions at midtest, $F(2, 123) = 7.48$, $p < .001$, $\eta^2_p = 0.11$, and posttest, $F(2, 123) = 11.17$, $p < .001$, $\eta^2_p = 0.15$. At midtest and posttest, follow-up analyses showed that sentence-combining and planning students used more varied vocabulary than control students (*p*s < .016). Moreover, only at posttest, sentence-combining students outperformed planning students ($p = .013$). Tests of simple main effects revealed differences between testing sessions for the sentence-combining group, $\Lambda = .74$, $F(2, 122) = 21.29$, $p < .001$, $\eta^2_p = 0.26$. Follow-up analyses showed a progressive increase in vocabulary diversity from pretest to midtest, and from midtest to posttest (*p*s < .001).

Ratio of modifiers. There was a statistically significant effect of testing time, with a progressive increase from pretest to midtest, and from midtest to posttest ($p < .012$). The Condition x Testing Time interaction was not reliable.

Variety of modifiers. There were statistically significant effects for condition, testing time, and the interaction between the two. Tests of simple main effects for the interaction revealed differences between conditions at posttest, $F(2, 123) = 12.70$, $p < .001$, $\eta^2_p = 0.17$. Follow-up analyses showed that sentence-combining and planning students used more diversified modifiers than control students (ps < .003). Tests of simple main effects also revealed differences between testing sessions for the sentence-combining group, $\Lambda = .58$, $F(2, 122) = 44.86$, $p < .001$, $\eta^2_p = 0.42$, and for the planning group, $\Lambda = .74$, $F(2, 122) = 21.30$, $p < .001$, $\eta^2_p = 0.26$. Follow-up analyses showed that the variety of modifiers increased from pretest to midtest, and from midtest to posttest in the sentence-combining group (ps < .001), but only increased from midtest to posttest in the planning group ($p < .001$).

Motivational Measure: Self-Efficacy

There was a statistically significant main effect of testing time, with self-efficacy beliefs increasing from pretest to posttest. No interaction between condition and testing time was found. To explore the relationship between self-efficacy and writing quality we calculated the correlation between these two variables for each condition before and after instruction. At pretest, we did not find statistically significant correlations in any group (rs < .29, ps > .08). Notably, at posttest, self-efficacy and writing quality were correlated in both planning ($r = .46$, $p < .001$) and sentence-combining ($r = .51$, $p < .001$) groups, but not in the control group ($r = .20$, $p = .22$).

Generalization Measure: Summary Writing

Sensitivity to importance. There was a statistically significant interaction between condition and testing time. Tests of simple main effects for the interaction revealed differences between conditions at posttest, $F(2, 123) = 5.26$, $p = .006$, $\eta^2_p = 0.08$. Follow-up analyses showed that planning students were better at discriminating information relevance than sentence-combining and control students (ps < .007). Tests of simple main effects also revealed a statistically significant increase in sensitivity to importance from pretest to posttest for the planning group, $\Lambda = .90$, $F(2, 122) = 13.18$, $p < .001$, $\eta^2_p = 0.10$.

Sentences transformation. Although there was a statistically significant main effect of testing time, the Condition x Testing Time interaction was not reliable.

Social Validity

Intervention students were very positive about the perceived value of the taught strategies. Almost all students agreed (5) or strongly agreed (6) that: the strategy helped them to write better in general (92%; M = 5.44, SD = 0.33) and opinion essays in particular (99%; M = 5.91, SD = 0.33), they would continue to use the strategy (92%; M = 5.64, SD = 0.67), the strategy should be taught to other students (99%; M = 5.82, SD = 0.41), and they would like to learn strategies for other genres (89%; M = 5.48, SD = 0.78). Also, 66% of the students disagreed (2) or strongly disagreed (1) that the strategy was difficulty (M = 2.27, SD = 1.38).

Additional Analyses: Classroom Effects

Because interventions were delivered to intact classrooms, we further explored if there were differences across classrooms participating in the same instructional program. For that, we conducted separate 2 (classroom) x 3 (testing time) ANOVAs for planning and sentence-combining conditions. Except for coherence in planning instruction, Λ = .66, $F(2, 45) = 11.52$, $p < .001$, $\eta^2_p = 0.34$, and variety of modifiers in sentence-combining instruction, Λ = .76, $F(2, 36) = 5.82$, $p = .006$, $\eta^2_p = 0.24$, instructional effects were not moderated by classroom (Fs < 2.38, ps < .12). Regarding coherence, the two classrooms receiving planning instruction significantly increased across instruction, Λ = .65, $F(2, 45) = 12.21$, $p < .001$, $\eta^2_p = .35$ versus Λ = .67, $F(2, 45) = 10.90$, $p < .001$, $\eta^2_p = .33$, and showed no differences at posttest ($F < 1$). Nevertheless, at midtest, one of the classes wrote more coherent texts than the other one, $F(1, 46) = 13.27$, p = .001, $\eta^2_p = .22$. A similar patter was found for variety of modifiers in sentence-combining instruction. Both classrooms significantly improved across instruction, Λ = .45, $F(2, 36) = 22.30$, $p < .001$, $\eta^2_p = .55$ versus Λ = .46, $F(2, 36) = 20.92$, $p < .001$, $\eta^2_p = .54$, and showed no posttest differences ($F < 1$). Still, at midtest, one of the classes used more diverse modifiers than the other one, $F(1, 37) = 8.70$, $p = .005$, $\eta^2_p = .19$.

Discussion

The present study evaluated the effectiveness of two strategy-focused interventions aimed to boost fifth and sixth graders' opinion essay writing by teaching them a planning or a sentence-combining strategy. Instructional effects were assessed on strategy-specific skills, writing performance, discourse-, sentence-, and word-levels of written language, self-efficacy beliefs, and summary writing.

Strategy-Specific Effects

In line with previous findings (e.g., Glaser & Brunstein, 2007; Saddler & Graham, 2005), we showed that planning and sentence-combining instruction increased students' planning and sentence-construction skills, respectively. In comparison to sentence-combining and control students, planning students created more complex plans, both at midtest and posttest. These students' planning skills largely and progressively increased throughout instruction. Conversely, sentence-combining students correctly combine more sentences than planning and control students, both at midtest and posttest. Although students' ability to combine sentences showed an upward trend during instruction, it only significant increased from midtest to posttest. This result suggests that the first five lessons did not provide students enough practice in sentence combining. Furthermore, it reinforces Strong's (1986) claim that sentence-combining skills may benefit from providing students extended opportunities to apply them in composition.

Writing Performance Effects

The hypotheses regarding the impact of strategy instruction on writing performance were partially confirmed. We found that the interventions focused either on planning or on sentence combining had a positive impact on opinion essay quality. These effects were found at posttest, and also at midtest. The fostering of self-regulation might have promoted the integration of the target strategy into composition, even before students were explicitly instructed in how to do it. Yet, we think that the instructional component focused on this integration was decisive given that only posttest quality was superior to pretest quality. Reproducing meta-analyses findings (Graham & Perin,

2007), we found stronger effect sizes for planning than sentence-combining instruction, even though the interventions did not significantly differ between them. Notably, this is the first study showing the effectiveness of teaching a sentence-combining strategy coupled with self-regulation procedures to promote writing quality. This result supports the use of the SRSD instructional model to foster composing processes besides planning and revising.

As predicted, strategy instruction also resulted in longer opinion essays than control instruction at posttest. Although increases in text length had already been reported after planning instruction (De La Paz & Graham, 2002; Graham et al., 2005; Harris et al., 2006), Saddler and Graham (2005) found no changes in text length after sentence-combining instruction. Despite some differences between their study and ours (e.g., target genre, duration of instruction, participants' grade), the promotion of self-regulation in our program might explain the very large posttest effect size favoring sentence-combining instruction.

Discourse-, Sentence-, and Word-Level Effects

As expected, we found that planning students wrote more complete and coherent essays than sentence-combining and control students. Thus, teaching a planning strategy plus self-regulation procedures seems to be an effective way to promote students' writing at the discourse level. Importantly, planning students register a progressive growth in all discourse-level measures across testing sessions, even though only pretest-midtest increases were larger enough to be statistically significant. It seems that practicing the planning strategy alone was sufficient for students to increase the completeness and coherence of their opinion essays. This is not to say, however, that composing opportunities are worthless. Actually, three findings suggest that planning students beneficiated from lessons integrating the planning strategy with composition: (a) the strongest effect sizes favoring planning instruction occurred at posttest; (b) the superiority of planning over sentence-combining instruction was mainly found at posttest; and (c) only one of the classes receiving planning instruction wrote more coherent texts than their peers at midtest. It is also noteworthy that planning students surpassed control students at the sentence and word levels. It is likely that by generating and organizing their ideas before writing, they were able to focus on sentence and word-

level concerns during writing (Graham & Harris, 2007; Kellogg, 1988). The finding that clause length remained uninfluenced by planning instruction was not surprising. Even traditional grammar instruction was shown to have no effect on syntactic complexity (Andrews et al., 2006). The instruction provided by the sentence-combining program seems to be needed to boost such a specific skill as the ability to produce complex syntactic structures.

Proving the effectiveness of sentence-combining instruction to influence students' writing at the sentence and word levels, we found that sentence-combining students displayed better sentence-construction and vocabulary skills than planning and control students. This result might be explained by the teaching of a sentence-combining strategy in tandem with self-regulation procedures, along with the use of specific practices to promote the transfer of the taught skills to composition (see section 2.2.1. for a description of these practices). Importantly, we also found that the majority of sentence-combining students' sentence- and word-level scores progressively increased from pretest to midtest, and from midtest to posttest. Still, only at posttest have sentence-combining students clearly outperformed their peers in almost all sentence- and word-level measures. This pattern of findings indicates that the use of isolated exercises to enhance sentence-combining skills might not be enough for students to transfer those skills to composition. Explicit teaching and systematic training in employing sentence-combining skills in writing seems to be needed not only to increase these skills (see the above section 4.1.), but also to apply them in text production. It is also noteworthy that sentence-combining instruction favored some discourse-related aspects of composition. The increase in sentence construction fluency might have enabled sentence-combining students to attend to other aspects of composition, such as text content and structure (Fayol, 1999; McCutchen et al., 1994; Strong, 1986). Probably, sentence-combining instruction did not influence elaborations and coherence because their development may require explicit teaching and guided practice.

Motivational Effects

Contrary to our predictions, the interventions failed to increase students' self-efficacy (for similar results, see Graham et al., 2005; Page-Voth & Graham, 1999;

Sawyer et al., 1992), probably, because it was being overestimated at pretest. Before instruction, self-efficacy and writing quality were not correlated. These results are consistent with Limpo and Alves (2013a), who found that self-efficacy did not contribute to writing quality in Grades 4-6. Of great import, this pattern changed at posttest, where we found moderate correlations between self-efficacy and writing quality for both planning and sentence-combining groups. Strategy instruction seemed to reduce the discrepancy between students' self-efficacy beliefs and their actual performance, which might be explained by the teaching of self-regulation procedures (Klassen, 2002a; Schunk, 2003). In particular, self-monitoring might have helped students to gain conscious access to their successes and failures, turning their perception of ability more realistic and adjusted to their current performance.

Generalization Effects

As anticipated, planning instructional effects transferred to summary writing. Planning instruction seemed to be beneficial for students to discriminate between information that should and should not be included in a summary. This result suggests that besides mastering the planning routine, they also mastered the core principles of selecting and organizing information (Shepard, 2000). This enhanced sensitivity to importance via planning instruction was an important finding because this strategic skill is related to reading comprehension (Winograd, 1983). Refuting our hypothesis, sentence-combining effects did not transfer to sentences transformation in summary writing. Possibly, sentence-combining skills were not sufficiently acquired to be generalized to a different task (Chi & VanLehn, 2012). Indeed, students only obtained 4.52 points out of 8 in the posttest sentence-combining task. Alternatively, they might have failed in detecting any link between the sentence-combining and summary tasks (Perkins & Salomon, 2012). Perhaps due to poor procedural knowledge about summarizing, they did not know that they should have transformed rather than reproduced the original sentences.

Limitations and Future Directions

Six limitations of the current study should guide future research. First, as standardized writing tests in Portuguese are lacking, we only used researcher-

constructed tests. Future studies should also include standardized measures to assess instructional effects more comprehensively. Second, although participants were nested within classrooms, given the few classes involved (N = 6), we used participants as the unit of analysis. Overall, supplementary analyses suggested that interventions effectiveness did not differ across classrooms for the majority of outcomes assessed. Still, large-scale intervention studies using multilevel analyses are warranted to explore instructional effects both at the student and classroom levels. Third, writing prompts were not counterbalanced across testing sessions. Nevertheless, it was found that young students produce texts of similar length and quality in response to different opinion essay prompts (Harris et al., 2006). Indeed, we found no differences over time regarding control students opinion essays. Fourth, as youngsters are unlikely to preplan spontaneously (McCutchen, 2006), to avoid pretest floor effects, we asked them to preplan in all testing sessions. Nonetheless, more research is needed to examine the influence of writing instruction on the management of writing processes, similarly to Torrance et al. (2007; see also Fidalgo et al., 2008). Fifth, time constraints in the testing sessions impeded us to analyze instructional effects on revision, which should be address in the future because sentence combining can also be a revising tool (Zimmerman & Kitsantas, 2002). Finally, the present study did not explicitly test the incremental effect of self-regulatory training above and beyond sentence-combining instruction. Further research should compare teaching sentence combining plus self-regulation procedures with teaching sentence combining alone.

Conclusions

The present study adds to a growing body of research (Graham & Harris, 2007; Graham & Perin, 2007; Saddler, 2007) that using the SRSD model to teach key writing processes, such as planning and translation, is an effective way to foster students' writing. Of critical relevance was our finding that whereas planning instruction primarily boosted the discourse-related aspects of composition, sentence-combining instruction primarily enhanced writing at the sentence and word levels. The educational implication of this finding is twofold. On the one hand, by knowing students' writing needs, writing instruction can be specifically tailored to the levels of writing that are a

struggle for them. On the other hand, if the instructional goal is to promote text production in a comprehensive way, it will be beneficial to target several levels of written composition, simultaneously. As the present study compared two strategies targeting different writing processes occurring at different moments of text production, we believe that planning and sentence-combining instruction can be integrated within a single writing program. This program could taught students not only to generate and organize their ideas ahead of writing but also to transform them in interesting and mature sentences in writing. Indeed, although instructional effects showed some transfer across levels, by coupling planning with sentence-combining instruction, one can expect far-reaching gains in students' ability to write proficiently at several levels of text production.

STUDY 4

IMPLICIT THEORIES OF WRITING

AND THEIR IMPACT ON STUDENTS' RESPONSE TO A SRSD INTERNVENTION

Published manuscript:
Limpo, T., & Alves, R. A. (2014). Implicit theories of writing and their impact on students' response to a SRSD intervention. *British Journal of Educational Psychology*. Advance online publication. doi:10.1111/bjep.12042

The development of writing expertise is a long and challenging process, heavily dependent upon four ingredients: skills, strategies, knowledge, and motivation (Alexander et al., 1998). To transform language representations into written text, developing writers need to master the low-level transcription skills of handwriting and spelling (Berninger et al., 1992). At the same time, they need to acquire a repertoire of strategies, such as planning or revising, that must be at their disposal for managing the complexity of the writing process (Pressley & Harris, 2006). These strategies are used in conjunction with writers' content and discourse knowledge that is stored in their long-term memory (McCutchen, 1986, 2006). A last ingredient that helps writers to persist in such a challenging task as writing, is motivation to write, which is affected by goals, predispositions, beliefs, attitudes, and cost-benefit estimates (Boscolo & Hidi, 2007; Hayes, 1996). Contrasting with the substantial amount of evidence about the role of skills, strategies, and knowledge in writing (for a review, see Graham, 2006b), the role of motivational factors has been neglected (Alves, 2012). Additional investigations are warranted to deepen our understanding about the motivational components of writing and their relation to cognitive ones.

A cornerstone of motivation to write is a set of beliefs that writers hold about themselves and about writing (for a review, see Bruning & Horn, 2000). The present research focuses on children's implicit theories of writing, which comprise beliefs about the malleability of their writing ability. We sought to contribute to extant research, first, by providing an instrument to measure these implicit theories and, then, by testing their predictive effect on students' response to a strategy-focused intervention.

Implicit Theories

People organize their world on the basis of meaning systems that emerge from their fundamental assumptions, or implicit theories, about the nature of the self and the social world (Molden & Dweck, 2006). These implicit theories have been largely studied in the intelligence domain, in which individuals were found to endorse different

implicit theories about the nature of their intellectual ability (Dweck & Leggett, 1988). People holding an entity theory view intelligence as a fixed entity that cannot be changed, whereas people holding an incremental theory conceive it as an increasable quality that can be developed. Empirical research has found that these implicit theories impact academic achievement in challenging situations by setting up distinct motivational frameworks of goals and learning patterns (Baird, Scott, Dearing, & Hamill, 2009; Blackwell, Trzesniewski, & Dweck, 2007; Dweck, 1986; Robins & Pals, 2002). Entity theorists tend to be focused on demonstrating their ability (performance goals). As a result, they are prone to show a helpless pattern, which involves challenge avoidance, strategies withdraw, negative affect, and ability-based attributions. This maladaptive, helpless pattern has negative consequences for learning outcomes by constraining skills acquisition and development. By contrast, incremental theorists tend to be focused on developing their ability (learning goals). These goals are liable to create a mastery-oriented pattern, which is characterized by challenge seeking, strategic behaviour, positive affect, and effort-based attributions. This adaptive, mastery-oriented pattern may foster competence gains and result in improved achievement. In sum, the two conceptions of intelligence create diverging motivational frameworks that impact students' achievement in academic tasks demanding hard work and persistence. In here, we proposed that these motivational frameworks could hold for writing as well.

Writers' beliefs about the malleability of their writing ability have received little attention in the writing domain (Bruning & Horn, 2000), even though they are likely to impact such a challenging process. Indeed, several years of deliberate practice and sustained effort seem to be necessary to effectively master all ingredients involved in writing (Kellogg, 2008; Kellogg & Whiteford, 2009). Therefore, thinking of it as a fixed or incremental skill is likely to shape how students experience and respond to writing instruction. Endorsing an entity theory of writing may have a deleterious effect on the process of learning to write. If students believe that writing ability is not subject to improvement, any endeavour to develop it will be seen as futile. On the contrary, endorsing an incremental theory of writing may set in motion a series of adaptive thoughts and behaviours that are at the root of writing proficiency. If students believe that writing ability can be cultivated, they will work hard and seek constructive strategies to improve it. It is noteworthy that this mastery-oriented pattern is aligned

with the purposes of strategy instruction, which aims to enhance effortful, goal-directed, and conscious processing in writing (Pressley & Harris, 2006).

Strategy Instruction: Self-Regulated Strategy Development

Strategy instruction was found to be one of the best teaching practices to promote writing quality in Grades 2–12 (for meta-analyses, see Graham, McKeown, et al., 2012; Graham & Perin, 2007; Rogers & Graham, 2008). A particularly effective model of strategy instruction is the Self-Regulated Strategy Development (SRSD; Graham, 2006a; Graham & Harris, 2003; Harris et al., 2009), which comprises six instructional stages: develop background knowledge, discuss it, model it, memorize it, support it, and independent performance. The SRSD provides explicit and systematic teaching of writing strategies combined with self-regulation procedures (Harris & Graham, 1996, 2009). The writing strategies contain the procedural knowledge to help students in carrying out writing-specific processes. The self-regulation procedures, such as goal setting, self-monitoring, and self-instructions, are critical for regulating strategies usage and writing behaviour (Alexander et al., 1998). Several studies have shown that the teaching of planning strategies coupled with self-regulatory training is a highly effective practice to increase writing quality (Brunstein & Glaser, 2011; Glaser & Brunstein, 2007; Graham et al., 2005; Harris et al., 2006; Limpo & Alves, 2013b; Torrance et al., 2007; Wong et al., 2008; Zumbrunn & Bruning, 2013).

A set of beliefs that have received considerable attention under the SRSD framework is self-efficacy, which refers to writers' confidence in their writing ability. Self-efficacy seems to be one of the strongest motivational predictors of writing performance. At different school levels, these beliefs predicted writing quality, above and beyond several motivational constructs such as writing apprehension, perceived usefulness of writing, self-efficacy for self-regulation, writing self-concept, and goals (Pajares, 2003; Pajares et al., 1999; Pajares & Valiante, 1997, 1999). This consistent finding might be explained by the close link between self-efficacy and self-regulation (Zimmerman, 1995). In particular, the successful use of self-regulation strategies results in strengthened self-efficacy beliefs, which help writers to maintain the self-regulated behaviour needed for effective writing (Zimmerman & Risemberg, 1997). Indeed, it has been found that, besides writing quality, SRSD interventions also enhance students'

self-efficacy (Graham, 2006a; Graham & Harris, 2003; Harris et al., 2009). Brunstein and Glaser (2011) provided strong evidence on the relationship between these beliefs, self-regulation, and writing performance. These authors have examined the underlying mechanisms of a successful self-regulation-based intervention. Of great interest was their finding that the SRSD intervention was associated with stronger self-efficacy beliefs, and that this enhanced self-efficacy contributed to a proper implementation of the taught strategies, which resulted in better texts. Although this study shed some light on the role of writing beliefs in strategy-focused interventions, more research is needed to increase knowledge about child writers' beliefs and their relationship to self-regulated behaviors and writing performance.

Present Research

Notwithstanding that SRSD has been found to enhance students' writing performance and self-efficacy, there is little research focusing on other types of beliefs and exploring their role in students' progress over SRSD interventions. Nevertheless, if one wants to maximize students' success throughout the learning process, uncovering some of these factors is as important as demonstrating interventions' effectiveness. The main purpose of the current research was to test whether the expected growth in writing performance of Portuguese students receiving a SRSD strategy-focused intervention was influenced by their implicit theories of writing. For that we conducted a pilot study and an intervention study.

Pilot Study

Despite the little attention that writing motivation has received, writing researchers have made efforts to develop instruments that measure different types of writing beliefs, such as self-efficacy beliefs (Bruning et al., 2013; Pajares, 2003; Shell, Murphy, & Bruning, 1989), beliefs in the perceived usefulness of writing (Pajares & Valiante, 1997), transmissional and transactional beliefs (White & Bruning, 2005), and beliefs in giftedness (Palmquist & Young, 1992). Besides these several types of beliefs may be related to implicit theories of writing, they are not the same. Indeed, to the best of our knowledge, there are no instruments explicitly tapping writers' beliefs about the

malleability of their writing skills, particularly, in children. As an attempt to fill this gap, we conducted a pilot study aimed to develop and test the Implicit Theories of Writing scale, which was cross-validated in the study described below.

Intervention Study

In this study, fifth and sixth graders participated in a SRSD intervention that taught them a planning strategy plus self-regulation procedures. Instructional effects were assessed on the length and quality of opinion essays written before, in the middle, and after instruction. On the strength of the well-documented effectiveness of SRSD (Graham, 2006a; Graham & Harris, 2003; Graham & Hebert, 2010; Graham & Perin, 2007; Harris et al., 2009; Rogers & Graham, 2008), we expected that intervention students would write longer and better texts than control students. Importantly, we have also examined whether intervention students' implicit theories of writing influenced their expected growth throughout the intervention. Because incremental theorists believe in the value of effort and strategies to improve their skills (Dweck, 1999) and because SRSD aims to boost writing performance through effortful and strategic behaviours (Harris & Graham, 1996, 2009), we predicted that the more students endorsed incremental beliefs, the more they would benefit from strategy instruction. To test this hypothesis we used latent growth curve (LGC) modelling.

Although ANOVA-based models allow the description of average group changes, they neither examine individual differences in growth nor potential explanatory factors. These limitations can be overcome with LGC analysis, which is a powerful technique to study longitudinal change (Bollen & Curran, 2005; Duncan, Duncan, & Strycker, 2006). It allows the modelling of intra-individual change across time and inter-individual differences in those changes. Modelling growth not only at the group but also at the individual level is an asset to study writing development since children may display different developmental trajectories. Also important, is to examine the underlying factors that may account for this variability. Why some students progress faster than others? LGC modelling helps to answer this kind of questions by allowing the inclusion of potential predictors of change. Here, LGC modelling was used to examine the predictive effect of implicit theories of writing in students' growth in writing performance during a SRSD writing intervention.

Pilot Study

Method

Scale development. To create a valid measure of students' implicit theories of writing, we relied on existing scales of implicit theories of intelligence. Dweck and colleagues (Dweck, 1999) have developed a scale comprising three entity items (e.g., *You have a certain amount of intelligence, and you really can't do much to change it*). Several studies have supported the validity of this instrument ($\alpha > .93$, 2-weeks test-retest, $r = .80$; for a review, see Dweck, Chiu, & Hong, 1995). Based on it, Faria (2003; 2006) have developed the Personal Conceptions of Intelligence scale for the Portuguese context, which was also found to have good psychometric qualities ($\alpha > .76$, 1-month test-retest, $r = .56$). Based on the scales of Dweck (1999) and Faria (2003, 2006), we created five Portuguese items that were gathered in the Implicit Theories of Writing (ITW) scale.

Participants and procedure. Participants were 128 Portuguese students in Grades 5-6 (M_{age} = 10.7 years, SD = 0.8; 57 girls). The ITW was administered to groups of 15 students, before they were asked to perform several writing tasks for a larger research project, using online methods to study writing dynamics. Students were asked to rate their level of agreement with each sentence using a Likert scale ranging from 1 (*Completely disagree*) to 6 (*Completely agree*). As the items were phrased in their entity version, lower scores indicate incremental beliefs and higher scores indicate entity beliefs.

Results and Discussion

To test for ITW's validity, we used Confirmatory Factor Analyses (CFA). In the CFA model, all items were specified to load on the ITW latent variable. Before model evaluation, the variance of the latent factor was constrained to 1.0, so that all items' factor loadings could be freely estimated. To evaluate model fit we used the chi-square statistic (χ^2), the confirmatory fit index (CFI), and the root-mean-square error of approximation (RMSEA). CFI values greater than .95 and .90, and RMSEA values less than .06 and .10 are considered good and adequate fits, respectively (Hu & Bentler,

1999). The Akaike information criterion (AIC) was used for models comparison, considering smaller AIC values as indicative of better fits.

The absolute values of skewness and kurtosis did not exceed 3.0 and 10.0, respectively, indicating no distributional problems (Kline, 2005). Descriptive statistics for each item are displayed in Table 1 along with their inter-item and item-total correlations. Although a first evaluation of the model revealed an excellent fit to the data, $\chi^2(15, N = 128) = 1.77$, $p = .88$, CFI = 1.00, RMSEA = .00, $P(\text{rmsea} \leq .05) = .93$, AIC = 31.77, items 3 and 4 seemed problematic: They had the smallest inter-item and item-total correlations, and factor loadings were lower than accepted (see Tables 1-2). Besides all items seem related to implicit theories of writing, they might be measuring different facets of it. Items 1, 2, and 5 are focused on improving writing quality through effort, whereas items 3 and 4 are about writing well as an innate ability. We also believe that the conditional phrasing of these two items might have posed some understanding problems to children. Therefore, we decided to remove items 3 and 4, and tested the fit of a model with the three remaining items. As this model was just-identified, error variances of the residual errors were constrained to be equal. Despite the slight decrement in some goodness-of-fit statistics, this new model fitted the data very well, $\chi^2(4, N = 128) = 4.18$, $p = .12$, CFI = .97, RMSEA = .09, $P(\text{rmsea} \leq .05) = .21$, AIC = 12.18. Actually, the decrease in AIC, the moderate inter-item and item-total correlations, and the good factor loadings suggested that this model was better than the five-item model (see Table 2). The internal consistency of scale was adequate, $\alpha = .69$ (Kline, 2005). Similarly to what have been found with measures of implicit theories of intelligence (Dweck et al., 1995), ITW did not differ between Grade 5 and 6, $t(126) = -0.81$, $p = .42$ ($M_{\text{Grade 5}} = 2.06$, $SD = 1.09$ vs. $M_{\text{Grade 6}} = 2.22$, $SD = 1.06$), and between boys and girls, $t(124) = 1.13$, $p = .26$ ($M_{\text{boys}} = 2.23$, $SD = 1.14$ vs. $M_{\text{girls}} = 2.02$, $SD = 0.96$). Overall, these piloting results provided preliminary evidence about the validity of the ITW to measure students' implicit theories of writing. Although it could be argue that the reduced number of items is a threat to ITW's validity, we do not think this is the case. Indeed, as stated by Messick (1995, p. 741) "validity is not a property of the test or assessment as such, but rather of the meaning of the test scores". We believe that these results, along with those obtained in the following study, support reliable interpretations of ITW scores.

Table 1

Descriptive statistics and correlations among the five items of ITW (piloting sample, *N* = 128).

Items	Descriptive statistics			Correlations				
	M (SD)	*Sk*	*Ku*	2.	3.	4.	5.	Item-Total
1. My texts will always have the same quality, no matter how much I try to change it.	2.37 (1.48)	1.02	0.13	.51	.26	.26	.38	.52
2. No matter how many texts I write, their quality will always be the same.	2.03 (1.26)	1.25	1.22		.29	.26	.38	.54
3. If I write well, it's because I was born like that.	2.52 (1.67)	0.81	-0.61			.15	.17	.30
4. If I do not write as well as I wish, I can't do much to change it.	2.09 (1.46)	1.26	0.53				.29	.33
5. I can't change the quality of my texts.	2.06 (1.37)	1.44	1.48					.44

Note. These items are English translations of the Portuguese ones. Thus, they should not be used in other languages before adaptation and validation.

Table 2

Parameter estimates of the CFA models of the ITW with five items and three items (piloting sample, *N* = 128).

Items	5-item model			3-item model		
	B	*SE*	β	*B*	*SE*	β
1. My texts will always have the same quality, no matter how much I try to change it.	1.04	0.14	.71	1.06	0.13	.72
2. No matter how many texts I write, their quality will always be the same.	0.89	0.12	.71	0.79	0.12	.61
3. If I write well, it's because I was born like that.	0.63	0.17	.38			
4. If I do not write as well as I wish, I can't do much to change it.	0.57	0.15	.39			
5. I can't change the quality of my texts.	0.74	0.13	.54	0.81	0.12	.62

Note. All factor loadings were statistically significant at α = .001.

Intervention Study

Method

Participants and design. Participants were 213 Portuguese native speakers in Grades 5-6. Three students with special education needs plus 18 students that missed one or more evaluation moments were excluded from data analyses. Results were thus based on 192 students. The study involved a pre-test, mid-test, post-test quasi-experimental design. Within each grade level, each class was randomly assigned to a planning (5 classes) or control (4 classes) condition. Table 3 provides participants' demographic data.

Table 3
Demographic data of students participating in the intervention study by condition.

Measure	Condition	
	Intervention	Control
N	109	83
Gender (*N*s)		
Girl	57	43
Boy	52	40
Age (in years)		
M (*SD*)	11.1 (0.7)	11.2 (0.6)
Min–Max	9.1–13.8	10.1–12.7
Mother's educational level (%)		
Grade 4 or below	7.3	7.2
Grade 9 or below	20.2	27.7
High school	36.7	24.1
College or above	27.5	36.1
Unknown	6.4	4.8
School marks (1-5)		
$M_{Portuguese}$ (*SD*)	3.5 (0.8)	3.4 (0.9)
$M_{Mathematics}$ (*SD*)	3.4 (0.9)	3.5 (1.0)

Note. Mother's educational level was used as an index of students' socio-economic status. For school marks, 1 = *lowest score* and 5 = *highest score*.

SRSD intervention. Two Portuguese language teachers, who were 44 and 53 years old, and had, respectively, 16 and 24 years of teaching experience, implemented the intervention in their classes, during 12 90-min weekly lessons. The youngest teacher delivered the intervention to three classes, and the other to two classes. Students were taught a strategy to plan opinion essays, along with the necessary skills and knowledge

to properly use it. This strategy helped students to generate and organize ideas following the opinion essay structure. To promote strategy memorization, they were taught the mnemonic CRÊS, which stands for: tell what you believe, give 3 or more reasons, explain each reason, and wrap it up (this is the Portuguese adaptation of the mnemonic TREE developed by Harris et al., 2008). In line with the SRSD model, this strategy was coupled with self-regulation procedures. *Goal setting* helped students to guide their behaviour in a writing task. Students' goal was to write a complete opinion essay. *Self-monitoring* helped students to obtain concrete and visible evidence of their progress. Students were given a "self-monitoring sheet" where they: (a) set their goal, (b) registered and counted the number of essay parts, and (c) wrote a self-reinforcement statement. *Self-instructions* helped students to manage the planning strategy and the other self-regulation procedures. Using a "writing flowchart" they develop self-instructions to set goals, use the planning strategy, and check goals attainment. The following SRSD practices were used for teaching the writing and self-regulation strategies: development of knowledge for writing and self-regulation; explicit instruction, discussion, and modelling of the planning strategy and self-regulation procedures; promotion of strategies memorization; collaborative practice supported by teachers and guidance materials gradually faded; independent practice with minimal teacher support (see the Appendix for an overview of instructional procedures).

Several procedures were implemented to assure that planning instruction was delivered as intended. Before the intervention, teachers participated in an 8-h pre-intervention workshop in which they became acquainted with the theoretical and empirical basis of the intervention and received an instructional manual with detailed lessons' plans. During the intervention, teachers had weekly meetings with the first author to prepare the next lesson, and discuss the previous one. The rare deviations from instructional plans usually involved missed steps. Whenever possible, these were addressed in the next lesson. Teachers were also given a checklist with implementation steps to be checked off once completed. Based on these checklists, teachers completed 99% of the proposed steps. In one third of the lessons that were observed by the first author, they completed 97% of the proposed steps. Finally, the quality of these observed lessons was evaluated regarding: (a) level of students' engagement, (b) students' responses to questions and participation in discussion, (c) teachers' responses to

students' questions, (d) efficiency of instruction, and (e) pacing of instruction (based on Saddler & Graham, 2005). Averaged instructional quality was 3.8 (0 = *very low*; 4 = *very high*).

Control instruction. Control students received standard writing instruction, which was delivered by their Portuguese language teachers. These three teachers were not implementing the intervention. They reported to weekly allot between 45 and 90 min to writing instruction, which predominately involved grammar instruction and independent composing with little to no support. Although teachers refer to use the process approach recently included in the Portuguese language curriculum (Reis et al., 2009), no references were made to the explicit and systematic teaching of either writing strategies or self-regulation procedures to accomplish specific writing processes. Additionally, these students were asked to write the same number of opinion essays as intervention students.

Testing sessions. Students were evaluated before instruction, after Lesson 5, and after instruction. Students were given 8 min to plan an opinion essay plus 16 min to write it. Respectively, pre-test, mid-test, and post-test prompts were: "Do you think teachers should give homework every days?"; "Do you think children should go to bed early every days?"; "Do you think children should work out every days?". Assisted by a Portuguese Language teacher not implementing the intervention, we examined several prompts used in other studies and selected these three as the most similar across them, as well as the closest to fifth and six graders' writing assignments and daily-life concerns. The ITW scale developed in the pilot study was filled out once, at the beginning of the pre-test.

Writing measures. Opinion essay length was calculated with the Computerized Language Analysis software (MacWhinney, 2000). Opinion essay quality was assessed by two graduate students, blind to study purposes. To avoid biased judgments all texts were previously typed and corrected for spelling, punctuation, and capitalization errors (Berninger & Swanson, 1994). Using a scale ranging from 1 (*low*) to 7 (*high*), judges rated ideas quality, coherence, syntax, and vocabulary. These factors were averaged for each rater (Cronchabs' α was greater than .93 for the two judges across the three testing times). For all testing moments, inter-rater reliability was .96, using the Intraclass Correlation Coefficient. The final quality score was the average across raters.

Results

Cross-validation of the ITW. Table 4 displays descriptive statistics for each item of the ITW. The absolute values of skewness and kurtosis of the three items were below 2.0, suggesting no distributional problems (Kline, 2005). A CFA model similar to the one tested in the pilot study was then specified and evaluated. Once more, this model fitted the data very well, $\chi^2(4, N = 192) = 1.45$, $p = .49$, CFI = 1.00, RMSEA = .00, $P(\text{rmsea} \leq .05) = .63$, AIC = 9.45. At the item level, we have also found moderate inter-item and item-total correlations, as well as good factor loadings (see Table 4). The internal consistency of the scale was adequate, α = .76. Replicating piloting results, we found neither grade differences, $t(190) = 1.33$, $p = .19$ ($M_{\text{Grade 5}} = 2.53$, $SD = 1.22$ vs. $M_{\text{Grade 6}} = 2.32$, $SD = 0.96$) nor gender differences, $t(190) = 0.96$, $p = .34$ ($M_{\text{boys}} = 2.52$, $SD = 1.14$ vs. $M_{\text{girls}} = 2.36$, $SD = 1.08$) regarding students implicit theories of writing.

Table 4

Descriptive statistics and parameter estimates of the CFA model of ITW with 3 items (cross-validation sample, *N* = 192).

Items	Descriptive statistics			Parameter estimates		
	M (SD)	*Sk*	*Ku*	*B*	*SE*	β
1. My texts will always have the same quality, no matter how much I try to change it.	2.69 (1.5)	0.67	-0.47	1.17	0.10	.78
2. No matter how many texts I write, their quality will always be the same.	2.51 (1.30)	0.91	0.46	0.89	0.09	.69
3. I can't change the quality of my texts.	2.13 (1.26)	1.41	1.86	0.85	0.09	.67

Note. All factor loadings were statistically significant at α = .001.

Intervention effectiveness. Because this study used a quasi-experimental design, group differences at mid-test and post-test were examined with Analyses of Covariance, with the respective pre-test score as covariate. Assuring that the assumption of homogeneous regression slopes was met, we found no interactions between pre-test scores and condition (*p*s > .10). Furthermore, intervention students ($M = 2.41$, $SD = 1.11$) did not differ from control students ($M = 2.47$, $SD = 1.13$) regarding their implicit theories of writing at pre-test, $t(190) = 0.38$, $p = .71$. After adjusting for initial pre-test differences on text length, intervention students wrote longer texts than control students both at mid-test, $F(1, 189) = 50.01$, $p < .001$, $\eta_p^2 = 0.21$, and post-test, $F(1, 189) =$

70.86, $p < .001$, $\eta_p^2 = 0.27$. Likewise, after adjusting for initial pre-test differences on text quality, intervention students wrote better texts than control students both at mid-test, $F(1, 189) = 15.18$, $p < .001$, $\eta_p^2 = 0.07$, and post-test $F(1, 189) = 33.07$, $p < .001$, $\eta_p^2 = 0.15$. Table 5 and 6 provide, respectively, means and standard deviations for and correlations between opinion essay length and quality at the three testing moments by condition.

Table 5

Means, standard deviations, and means adjusted by pre-test scores for opinion essay length and quality by condition and testing time.

	Length		Quality	
	Intervention	Control	Intervention	Control
Pre-test				
M	86.08	84.41	3.68	3.88
SD	41.80	40.66	1.24	1.25
Mid-test				
M	99.92	68.94	4.00	3.57
SD	37.28	41.25	1.18	1.27
Adjusted *M*	99.46	69.54	4.05	3.50
Post-test				
M	128.38	78.86	4.49	3.74
SD	44.23	45.54	1.21	1.27
Adjusted *M*	128.01	79.34	4.54	3.68

Table 6

Correlations between opinion essay length and quality at pre-test, mid-test, and post-test by condition.

	Pre-test		Mid-test		Post-test	
Measures	Lenght	Quality	Lenght	Quality	Lenght	Quality
Pre-test						
Length	–	.59	.72	.49	.58	.57
Quality	.56	–	.50	.65	.67	.65
Mid-test						
Length	.64	.53	–	.62	.60	.62
Quality	.37	.57	.55	–	.64	.59
Post-test						
Length	.39	.44	.53	.28	–	.77
Quality	.33	.50	.41	.63	.49	–

Note. Correlations for the control condition ($n = 83$) are above the diagonal and for the intervention condition ($n = 109$) are below the diagonal. All correlations, except the one between post-test length and mid-test quality ($p = .004$), are significant at $\alpha = .001$.

To further explore instructional effects, we examine differences between testing times within each condition (see Figure 1, for a graphical representation). For that, we conducted two 2 x 3 Analyses of Variance (ANOVAs), with repeated measures on the last factor. For opinion essay length, we found a significant Condition x Testing Time interaction, $\Lambda = .75$, $F(2, 189) = 30.98$, $p < .001$, $\eta^2_p = 0.25$. Tests of simple main effects revealed differences between testing sessions for both the intervention group, $\Lambda = .66$, $F(2, 189) = 49.26$, $p < .001$, $\eta^2_p = 0.34$, and the control group, $\Lambda = .90$, $F(2, 189) = 10.01$, $p < .001$, $\eta^2_p = 0.10$. Still, while intervention students' text length increased from pre-test to mid-test, and from mid-test to post-test, control students' text length decrease from pre-test to mid-test (all ps < .001). Analogous effects were found for opinion essay quality. There was a significant Condition x Testing Time interaction, $\Lambda = .85$, $F(2, 189) = 16.35$, $p < .001$, $\eta^2_p = 0.15$, with significant differences across testing sessions for both the intervention group, $\Lambda = .78$, $F(2, 189) = 26.75$, $p < .001$, $\eta^2_p = 0.22$, and the control group, $\Lambda = .97$, $F(2, 189) = 3.45$, $p = .03$, $\eta^2_p = 0.04$. Again, while intervention students' text quality increased from pre-test to mid-test, and from mid-test to post-test (ps < .007), control students' text quality decreased from pre-test to mid-test ($p = .03$).

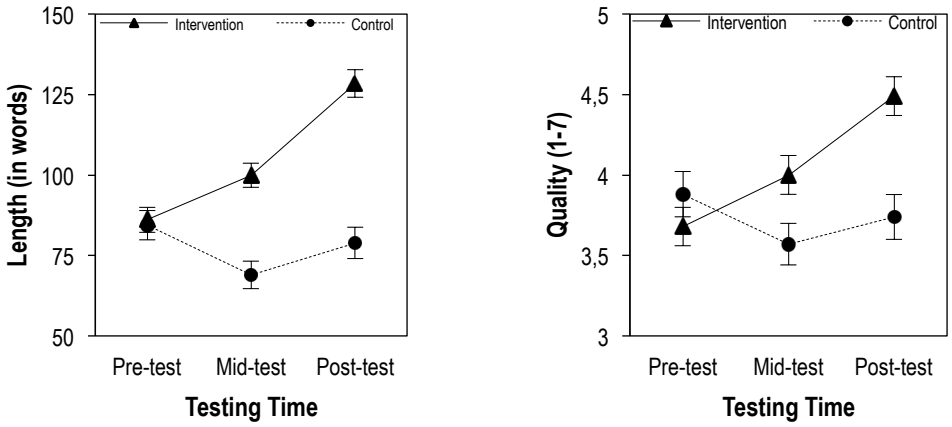


Figure 1
Opinion essay length (on the left) and quality (on the right) by condition and testing time. Error bars represent standard errors.

Effect of ITW on intervention students' rate of growth. LGC modelling was used to examine if implicit theories of writing influenced intervention students' rate of growth in opinion essay length and quality. These trajectories were modelled within the structural equation modelling framework (Bollen & Curran, 2005; Duncan et al., 2006). Following Hox (2010) guidelines we specified two equivalent LGC models with two latent variables: intercept and slope. The mean of the latent intercept represents the average pre-test performance. As this value is constant over time, the factor loadings of the three testing moments on the intercept factor were fixed to 1.0. The mean of the latent slope represents the average rate of change over time. These trajectories were estimated with models that imposed linear constraints. Reflecting the uneven time spacing between pre-test and mid-test (6 weeks), and pre-test and post-test (14 weeks), the slope parameters were set to 0.0, 1.0, and 2.3 (14/6). Except the means of the latent factors, which were freely estimated, all other means and intercepts were fixed to zero. Additionally, latent factors were specified to covary, and error variances of the residual errors for the three testing times were constrained to be equal. The average score on the ITW scale was included in the model as a time-invariant predictor and, for both LGC models, direct effects from ITW to the intercept and slope factors were specified.

The evaluation of the LGC model for opinion essay length revealed a very good fit to the data, $\chi^2(10, N = 109) = 4.36$, $p = .36$, CFI = .996, RMSEA = .03, $P(\text{rmsea} \leq .05) = .49$, AIC = 24.36. The LGC model for opinion essay quality have also showed an excellent fit, $\chi^2(10, N = 109) = 1.76$, $p = .78$, CFI = 1.00, RMSEA = .00, $P(\text{rmsea} \leq .05) = .85$, AIC = 21.76. The parameter estimates of these two models are displayed in Table 7. In line with the repeated measures ANOVAs' results, the significant and positive means of the slopes indicate increases in intervention students' text length and quality over instruction. Regarding the predictive effects of ITW, no effects were found for opinion essay length, but, for opinion essay quality, students' implicit theories influenced both the latent intercept and the latent slope. More incremental beliefs were associated with higher quality at pre-test ($\beta = -.24$, $p = .03$) and greater increases in quality over time ($\beta = -.37$, $p = .04$).

Table 7

Parameter estimates for LGC models of prediction of change in opinion essay length and quality (intervention students, *n* = 109).

Parameter	Coefficient	*SE*	*p*
Opinion essay length			
Intercept mean	97.51	9.19	< .001
Intercept variance	1155.01	221.12	< .001
Slope mean	23.69	4.69	< .001
Slope variance	216.45	61.70	< .001
Intercept ↔ Slope	-245.44	93.72	.009
ITW → Intercept	-5.41	3.46	.12
ITW → Slope	-2.23	1.77	.21
Opinion essay quality			
Intercept mean	4.19	0.27	< .001
Intercept variance	0.89	0.19	< .001
Slope mean	0.56	0.12	< .001
Slope variance	0.06	.04	.17
Intercept ↔ Slope	-0.10	0.07	.15
ITW → Intercept	-0.21	0.10	.03
ITW → Slope	-0.09	0.44	.04

Discussion

A first goal of the present research was to propose a new instrument to measure students' implicit theories of writing. Preliminary validation of ITW was provided across two studies. First, ITW was based on existing and highly reliable measures of implicit theories of intelligence (Dweck, 1999; Faria, 2003, 2006), whose items were carefully adapted to the writing domain. Second, inter-item and item-total correlations, factor loadings, and scale reliability were all adequate. Third, the one-factor CFA model that fitted piloting data very well was also successfully cross-validated. Fourth, similar to what have been reported for implicit theories in other domains, ITW did not reveal gender and grade differences in implicit theories of writing. Finally, ITW influenced students' growth in writing quality in the expected direction, demonstrating its practical relevance to the study of writing development. All in all, these five sources of evidence seem to support adequate and meaningful interpretations of ITW scores as well as the usefulness of this instrument in writing research (for a discussion on validity, see Messick, 1995). It is important to highlight, however, that our research was a first step

toward the establishment of ITW's validity. Validation is an on-going process and further empirical evidence is clearly warranted. For instance, establishing ITW's discriminant validity would further support the interpretability of its scores. Given the documented role of self-efficacy beliefs in writing (for a review, see Pajares, 2003), it would be particularly important to examine in which extent implicit theories and self-efficacy measures are distinct from each other. Moreover, as ITW was only tested with 10-12 years old Portuguese children, additional tests across different age groups and languages would be worthwhile.

The other main goal of the present research was to test the predictive effect of students' implicit theories of writing on the effectiveness of a SRSD intervention. This strategy-focused intervention was aimed to improve fifth and sixth graders planning skills and, as expected, it resulted in longer and better opinion essays than standard writing instruction. Improving developing writers' planning skills is likely to enhance writing performance in several ways. Planning helps students to generate content and to create an organized structure for their compositions. Besides, the plan may function as an external memory where students store their ideas and outline action-plans to produce the text (Graham & Harris, 2007). This is expected to result in reduced planning during writing, enabling writers to focus on other key writing processes (Kellogg, 1988; Limpo & Alves, 2013b). As developing writers seem to struggle with such a core cognitive writing process as planning (Bereiter & Scardamalia, 1987; Limpo & Alves, 2013a; Limpo, Alves, & Fidalgo, 2013; McCutchen, 2006), it is of the utmost importance that evidence-based practices for boosting planning skills reach out to school settings.

Confirmed intervention effectiveness, we sought to examine if it was influenced by students' implicit theories of writing. As predicted, the more intervention students conceived writing as an increasable skill, the more the quality of their texts has improved. This result is likely to be explained by the motivational framework that stems from holding incremental beliefs (for a meta-analytic review, see Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013). Incremental theorists were found to set goals focused on learning and to believe in the efficacy of effort to reach them (Blackwell et al., 2007; Robins & Pals, 2002). Consequently, they have been shown to engage in positive, mastery-oriented strategies (Doron, Stephan, Boiché, & Le Scanff, 2009; Grant & Dweck, 2003). This constellation of goals, beliefs, and strategies form a self-

regulatory system that may work as catalyst for learning in challenging academic situations such as writing instruction (Zimmerman, 2000; Zimmerman & Risemberg, 1997). Therefore, we suppose that incremental theorists' willingness to improve their writing skills through effortful and strategic behaviours might have played a pivotal role in potentiating strategy-instruction effects. As this hypothesis was not empirically tested, writing researchers should delve into the cognitive and motivational factors that mediate the effect of writing beliefs on interventions' effectiveness. Finally, it is worth mentioning that implicit theories of writing contributed neither to the latent intercept nor to the latent slope for opinion essay length. Thus, these results imply that these beliefs contribute to qualitative aspects of text production but not to quantitative ones. Future research should ascertain whether these findings are replicable. In this case, it would be important to address the underlying factors of the differential effects of writing beliefs on text quality and length.

Although some limitations of the presented findings were already discussed, three additional concerns are worthy of notice. First, rate of growth was measured using only three testing times. Despite it was enough to model the growth in writing during 12 weeks, using only three occasions could have produced less precise estimates (Willett, 1989). Writing researchers may consider examine the effects of implicit theories on growth throughout longer interventions and using more data points. This would also allow the modelling of more complex, non-linear trajectories, probably, more suitable to describe students' improvement in writing.

Second, ITW was only administered once, precluding us to test temporal stability. Future research should administer ITW over different time intervals not only to further inform on its psychometric properties, but also to answer questions about the role of age and schooling in shaping implicit theories of writing. Actually, although we did not test it, the intervention might have changed these writing beliefs. SRSD instructional procedures aim to highlight the role of strategies and effort in writing, to focus students' attention on their improvement, and to encourage strategy- and effort-based attributions for success and failure (Harris & Graham, 2009). Because these are the underlying ingredients of incremental theories (Blackwell et al., 2007), one would expect that SRSD would promote incremental views of writing. Further studies are

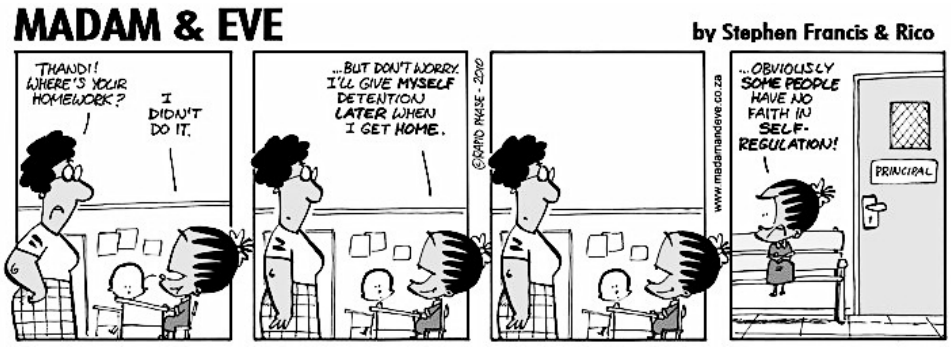
needed to corroborate this hypothesis and to examine whether this expected change in implicit theories also contributes to intervention effectiveness.

Third, because we only have access to the final versions of the written materials produced during the intervention, which resulted from a close teachers-students' collaboration, we were not able to reliably relate implicit theories to students' self-regulated behaviours. It would have been particularly valuable to examine whether writing beliefs impacted writing goals, self-monitoring accuracy, and self-reinforcement statements. Future SRSD interventions should be planned to guarantee the reliability of such process materials, which may carry critical information to understand the impact of implicit theories on writing growth.

Educational Implications

By stressing the role of writing beliefs in the learning-to-write process, the present research has significant implications for writing instruction. In particular, teachers should be mindful of students' beliefs as well as nurture incremental views of writing. Through their pedagogical practices, teachers have the power to influence their students' beliefs. For instance, Mueller and Dweck (1998) have studied how teachers' praise acts on students' motivation and performance. They found that, compared to students praised for effort, those praised for ability were more likely to adopt performance goals, to explain failure in terms of low ability, to display less task persistence and enjoyment, to perform worse, and to endorse entity beliefs about intelligence. Besides pinpointing the damaging effects of ability-based praise, this research showed that implicit theories and accompanying thoughts, behaviours, and affects can be primed with smart, brief manipulations (see also Thompson & Musket, 2005). Albeit these effects' stability might be questionable, they hinted at the possibility of changing students' implicit theories. Several studies have already reported on effective programs to teach incremental views of intelligence (e.g., Blackwell et al., 2007; Donohoe, Topping, & Hannah, 2013; Good, Aronson, & Inzlicht, 2003). These results look to be very encouraging for writing researchers and practitioners. The use of similar programs, mainly if combined with strategy instruction, could be especially advantageous to raise developing writers' incremental beliefs and, ergo, boost their writing performance.

GENERAL CONCLUSIONS



Although sometimes is difficult to trust in children's ability to regulate their own learning, we should, indeed, have faith in self-regulation. The acquisition of high-levels of self-regulation is an asset across the numerous spheres of our lives (for a review, see Boekaerts, Pintrich, & Zeidner, 2000). Therefore, we should contribute as much as we can to build self-regulated children either in school or at home. In the present thesis we have highlighted how the cognitive and motivational processes involved in self-regulation are pivotal in proficient writing. Across four studies we have provided compelling evidence that the long road from novice to expert writing critically relies on the development of increasingly sophisticated self-regulation skills that enable the effective management of the plethora of processes involved in text production.

Recapitulation

In Study 1 we used multiple-group structural equation modeling to test the contribution of transcription (handwriting and spelling) and self-regulation (planning, revision, and self-efficacy) to writing quality at two developmental points (Grades 4-6 vs. 7-9). Transcription and self-regulation accounted for 76% and 82% of the variance in writing quality in Grades 4-6 and 7-9, suggesting that these variables are two critical ingredients in good writing. In the younger sample, transcription contributed directly to writing quality, indicating a lack of automaticity in handwriting and spelling. Transcription had also contributed directly to planning, revision, and self-efficacy,

meaning that fast and accurate transcription was associated to better self-regulation processes. However, we did not find a contribution of planning, revision, and self-efficacy to writing quality. This might be related to novice writers' difficulties in using self-regulation strategies and supportive motivation in the benefit of text production. A different pattern was found in the older sample, in which transcription influenced writing quality indirectly via planning and self-efficacy. This result supported our claim that self-regulation may play a mediating role in the relationship between transcription and writing. The reduced cognitive cost of efficient, automatic transcription may facilitate the acquisition and development of self-regulated, strategic behaviors, fundamental to produce high-quality texts. Explicit instruction and practice in handwriting, spelling, planning, and revising along with nurturing of realistic self-efficacy beliefs may, therefore, facilitate writing development beyond primary grades.

To delve into the role of planning and revising processes in developing writing we conducted a second study, whose main goal was twofold: to trace the development of the high-level writing processes of planning and revising, from Grade 4 to 9, and to examine the incremental validity of these skills in predicting writing quality in younger and older students (Grades 4-6 vs. 7-9), over a set of well-known predictors of writing performance (viz., gender, school achievement, age, handwriting fluency, spelling, and text structure). From Grade 4 to 9, we found a growing trend in students' ability to plan and revise, suggesting that writing instruction supports the development of these skills throughout schooling. Moreover, whereas younger students' planning and revising skills made no contribution to the quality of their writing, in older students, these high-level skills contributed to writing quality above and beyond control predictors. These findings suggest that despite planning and revising are key writing predictors in older students, these skills do not seem fully operational in younger students. It seems that they are not receiving the appropriate writing instruction needed to use well-developed planning and revising skills in the benefit of text production. These results align with those of Study 1 suggesting that supplementary explicit instruction and intensive practice targeting planning and revising should be provided from early on. Efforts should, therefore, be made to design and give teachers evidence-based practices that they can use to support young writers' high-level writing skills. This was the overall goal of the third study.

In Study 3 we tested the effectiveness of two strategy-focused interventions aimed to promote opinion essay writing in Grades 5-6. Over 12 weekly 90-min lessons, two groups of students received, respectively, planning and sentence-combining SRSD instruction, and were compared with a practice control group. Instructional effects were assessed on strategy-specific skills, writing performance, levels of written language, self-efficacy, and summary writing. We showed that planning and sentence-combining instruction increased students' planning and sentence-construction skills, respectively. Additionally, we found that both interventions had a positive impact on opinion essay quality and text length, confirming the effectiveness of SRSD instruction to raise writing performance. Regarding writing levels, we found that planning instruction enhanced not only discourse-level writing but also some sentence- and word-level aspects of composition; in contrast, we found that sentence-combining instruction enhanced not only sentence- and word-level writing but also some discourse-level aspects of composition. Despite the limited transfer effects across levels, these findings indicate that multicomponent writing programs might be needed to comprehensively promote text production. Although SRSD instruction did not increase self-efficacy beliefs as expected, at posttest, we found a correlation between self-efficacy and writing quality in both intervention groups. This correlation was absent at pretest, suggesting that SRSD instruction might have reduced an initial discrepancy between self-efficacy and writing performance. Finally, we found that planning instructional effects generalized to summary writing, meaning that students might have mastered the core principles of selecting and organizing information.

Despite this study provided important contributions on the pivotal role of self-regulation strategies in writing, it informed little about how students' self-motivation beliefs may have influenced their response to a self-regulation-based intervention. This question was addressed in the last study of the present thesis. We first conducted a pilot study in which we developed the Implicit Theories of Writing (ITW) scale. Then, we conducted an intervention study, in which the SRSD planning intervention, developed in the previous study, was delivered to fifth and sixth graders, which were compared with control students receiving standard writing instruction. Students were evaluated before, in the middle, and after instruction. ITW's validity was supported by piloting results and their successful cross-validation in the intervention study. Both at the middle

and at the end of the intervention, students wrote longer and better texts than control students, confirming again the effectiveness of SRSD. Moreover, latent growth curve modelling showed that the more intervention students conceived writing as an incremental skill, the more the quality of their texts improved. This later finding indicated that the extent to which students believe they can improve their writing skills is critically related to the extent to which they really improve them. This study was of great educational relevance by upholding the influential role of self-motivation beliefs in students' ability and willingness to self-regulate their writing.

Next Steps

The present thesis join to a growing body of research showing that, to master writing, children need to develop increasingly sophisticated transcription, language, and self-regulation skills. Transcription allows writers to execute the handwriting movements for producing orthographic symbols (Abbott & Berninger, 1993). Language enables writers to express ideas through syntactically correct and complex sentences (Beers & Nagy, 2009). Self-regulation supports writers in attaining their literary goals through strategy usage (Zimmerman & Risemberg, 1997). Several studies, including those here described, have been demonstrating that more automatic transcription, greater language ability, and more self-regulated strategy usage are all associated with better writing. Notwithstanding the sound evidence on the importance of transcription, language, and self-regulation (Alves & Limpo, 2014), most of these studies have provided a limited-scope view of writing, since they examined these skills separately. A question still to be answered is: How transcription, language, and self-regulation interact with each other to build writing proficiency?

It would be particularly important to look for answers to this question by combining correlational and intervention research. Correlational studies could examine whether language and self-regulation skills mediate the relationship between transcription and writing quality. It is well established that children's transcription skills contribute to writing quality (Graham & Harris, 2000). It seems that children's transcription is so demanding, that it hinders the development of skills needed to produce high-quality texts (Bourdin & Fayol, 1994, 2000; Olive & Kellogg, 2002).

Despite this common assumption, few studies have precisely examined which skills mediate this relationship. Language and self-regulation are probable mediators of the relationship between transcription and writing quality. More automatic transcription may free attentional resources that might prompt the development of students' ability to build well-crafted sentences and act strategically during text production, thereby resulting in better writing.

Intervention studies could design and test multicomponent writing interventions for beginning writers. To effectively produce text, writers need to master written language at different levels (viz., word, sentence, and discourse): Good writing relies on writers' ability to carefully select words that are combined in syntactically correct sentences coherently organized into paragraphs. Although writing interventions targeting a single writing level have been proven to increase writing performance, multicomponent interventions are likely to produce wide-ranging improvements in students' writing ability. By respectively targeting writing at the word, sentence, and discourse levels, an intervention promoting the capabilities of transcription, language, and self-regulation in an integrated way, might be a powerful tool for fostering writing from very early one.

Ending

Altogether, the studies reported in the present thesis suggest that self-regulation is a key ingredient to write proficiently and that increasing students strategic behaviour in writing and nurturing positive self-beliefs are effective ways of boosting students' competence in producing texts. To know this is particularly important for teachers, who day after day struggle in how to pave the way for their students to become better writers. Four years ago, I have joined them in this tough journey…

Mas corto as ondas sem desanimar.
Em qualquer aventura,
O que importa é partir, não é chegar.

Miguel Torga (1962), Câmara Ardente

REFERENCES

Abbott, R. D., & Berninger, V. W. (1993). Structural equation modeling of relationships among developmental skills and writing skills in primary- and intermediate-grade writers. *Journal of Educational Psychology, 85*, 478-508. doi: 10.1037/0022-0663.85.3.478

Abbott, R. D., Berninger, V. W., & Fayol, M. (2010). Longitudinal relationships of levels of language in writing and between writing and reading in grades 1 to 7. *Journal of Educational Psychology, 102*, 281-298. doi: 10.1037/a0019318

Alamargot, D., & Fayol, M. (2009). Modeling the development of written composition. In R. Beard, D. Myhill, J. Riley & M. Nystrand (Eds.), *The Sage handbook of writing development* (pp. 23-47). London: Sage.

Alamargot, D., Plane, S., Lambert, E., & Chesnet, D. (2010). Using eye and pen movements to trace the development of writing expertise: Case studies of a 7th, 9th and 12th grader, graduate student, and professional writer. *Reading and Writing: An Interdisciplinary Journal, 23*, 853-888. doi: 10.1007/s11145-009-9191-9

Alexander, P. A., Graham, S., & Harris, K. R. (1998). A perspective on strategy research: Progress and prospects. *Educational Psychology Review, 10*, 129-154. doi: 10.1023/A:1022185502996

Allal, L., Chanquoy, L., & Largy, P. (Eds.). (2004). *Revision: Cognitive and instructional processes.* Dordrecht: Kluwer Academic Publishers.

Álvares Pereira, L., Aleixo, C., Cardoso, I., & Graça, L. (2010). The teaching and learning of writing in Portugal: The case of a research group. In C. Bazerman, R. Krut, K. Lunsford, S. Mcleod, S. Null, P. Rogers & A. Stansell (Eds.), *Traditions of writing research* (pp. 58-70). New York, NY: Routledge.

Alves, R. A. (2012). The future is bright for writing research. In V. W. Berninger (Ed.), *Past, present, and future contributions of cognitive writing research to cognitive psychology* (pp. 593-599). New York, NY: Psychology Press.

Alves, R. A., Branco, M., Castro, S. L., & Olive, T. (2012). Effects of handwriting skill, handwriting and dictation modes, and gender of fourth graders on pauses, written language bursts, fluency, and quality. In V. W. Berninger (Ed.), *Past,*

present, and future contributions of cognitive writing research to cognitive psychology (pp. 389-402). New York, NY: Psychology Press.

Alves, R. A., & Haas, C. (2012). Special issue: Writing and cognition, in Honor of John R. Hayes: Editors' Introduction. *Written Communication, 29*, 239-243. doi: 10.1177/0741088312451110

Alves, R. A., & Jesus, I. (2011). *Bursts of written language production increase across the initial years of schooling*. Paper presented at the 14th Biennal Conference of the European Association for Research on Learning and Instruction, Exeter, UK.

Alves, R. A., & Limpo, T. (2014). Fostering the capabilities that build writing achievement. In P. McCardle & C. Connor (Eds.), *Reading intervention: From research to practice to research*. Baltimore, MD: Brookes Publishing.

Andrews, R., Torgerson, C., Beverton, S., Freeman, A., Locke, T., Low, G., . . . Zhu, D. (2006). The effect of grammar teaching on writing development. *British Educational Research Journal, 32*, 39-55. doi: 10.1080/01411920500401997

Baddeley, A. D. (1986). *Working memory*. Oxford: Oxford University Press.

Baddeley, A. D. (2007). *Working memory, thought and action*. Oxford: Oxford University Press.

Baird, G. L., Scott, W. D., Dearing, E., & Hamill, S. K. (2009). Cognitive self-regulation in youth with and without learning disabilities: Academic self-efficacy, theories of intelligence, learning vs. performance goal preferences, and effort attributions. *Journal of Social and Clinical Psychology, 28*, 881-908. doi: 10.1521/jscp.2009.28.7.881

Bandura, A. (1969). *Principles of behavior modification*. New York, NY: Holt, Rinehart and Winston.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.

Beal, C. R. (1990). The development of text evaluation and revision skills. *Child Development, 61*, 247-258. doi: 10.2307/1131063

Beal, C. R., Garrod, A. C., & Bonitatibus, G. J. (1990). Fostering children's revision skills through training in compregension monitoring. *Journal of Educational Psychology, 82*, 275-280. doi: 10.1037/0022-0663.82.2.275

Beauvais, C., Olive, T., & Passerault, J.-M. (2011). Why are some texts good and others not? Relationship between text quality and management of the writing

processes. *Journal of Educational Psychology, 103*, 415-428. doi: 10.1037/a0022545

Beers, S. F., & Nagy, W. E. (2009). Syntactic complexity as a predictor of adolescent writing quality: Which measures? Which genre? *Reading and Writing: An Interdisciplinary Journal, 22*, 185-200. doi: 10.1007/s11145-007-9107-5

Bereiter, C., & Scardamalia, M. (1987). *The psychology of written composition*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Berman, R. A., & Slobin, D. I. (Eds.). (1994). *Relating events in narrative: A crosslinguistic developmental study*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Berninger, V. W. (1999). Coordinating transcription and text generation in working memory during composing: Automatic and constructive processes. *Learning Disability Quarterly, 22*, 99-112. doi: 10.2307/1511269

Berninger, V. W. (Ed.). (2012). *Past, present, and future contributions of cognitive writing research to cognitive psychology*. New York, NY: Psychology Press.

Berninger, V. W., Cartwright, A. C., Yates, C. M., Swanson, H. L., & Abbott, R. D. (1994). Developmental skills related to writing and reading acquisition in the intermediate grades: Shared and unique functional systems. *Reading and Writing: An Interdisciplinary Journal, 6*, 161-196. doi: 10.1007/BF01026911

Berninger, V. W., & Chanquoy, L. (2012). What writing is and how it changes across early and middle childhood development: A multidisciplinary perspective. In E. L. Grigorenko, E. Mambrino & D. D. Preiss (Eds.), *A mosaic of new perspectives* (pp. 65-84). London: Psychology Press.

Berninger, V. W., Nagy, W. E., & Beers, S. F. (2011). Child writers' construction and reconstruction of single sentences and construction of multi-sentence texts: Contributions of syntax and transcription to translation. *Reading and Writing: An Interdisciplinary Journal, 24*, 151-182. doi: 10.1007/s11145-010-9262-y

Berninger, V. W., Rutberg, J. E., Abbott, R. D., Garcia, N., Anderson-Youngstorm, M., Brooks, A., & Fulton, C. (2006). Tier 1 and tier 2 early intervention for handwriting and composing. *Journal of School Psychology, 44*, 3-30. doi: 10.1016/j.jsp.2005.12.003

Berninger, V. W., & Swanson, H. L. (1994). Modifying Hayes and Flower's model of skilled writing to explain beginning and developing writing. In E. C. Butterfield (Ed.), *Children's writing: Toward a process theory of the development of skilled writing* (Vol. 2, pp. 57-81). Greenwich, Connecticut: JAI Press.

Berninger, V. W., Vaughan, K. B., Abbott, R. D., Begay, K., Coleman, K. B., Curtin, G., . . . Graham, S. (2002). Teaching spelling and composition alone and together: Implications for the simple view of writing. *Journal of Educational Psychology, 94*, 291-304. doi: 10.1037//0022-0663.94.2.291

Berninger, V. W., Vaughan, K. B., Abbott, R. D., Brooks, A., Abbott, S. P., Rogan, L. W., . . . Graham, S. (1998). Early intervention for spelling problems: Teaching functional spelling units of varying size with a multiple-connections framework. *Journal of Educational Psychology, 90*, 587-605. doi: 10.1037/0022-0663.90.4.587

Berninger, V. W., Whitaker, D., Feng, Y., Swanson, H. L., & Abbott, R. D. (1996). Assessment of planning, translating, and revising in junior high writers. *Journal of School Psychology, 34*, 23-52. doi: 10.1016/0022-4405(95)00024-0

Berninger, V. W., & Winn, W. (2006). Implications of advancements in brain research and technology for writing development, writing instruction, and educational evolution. In C. A. MacArthur, S. Graham & J. Fitzgerald (Eds.), *Handbook of writing research* (pp. 96-114). New York, NY: Guilford Press.

Berninger, V. W., Yates, C. M., Cartwright, A. C., Rutberg, J., Remy, E., & Abbott, R. D. (1992). Lower-level developmental skills in beginning writing. *Reading and Writing: An Interdisciplinary Journal, 4*, 257-280. doi: 10.1007/BF01027151

Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and intervention. *Child Development, 78*, 246-263. doi: 10.1111/j.1467-8624.2007.00995.x

Boekaerts, M., Pintrich, P. R., & Zeidner, M. (Eds.). (2000). *Self-regulation: Theory, research, and applications*. Orlando, FL: Academic Press.

Bollen, K. A., & Curran, P. J. (2005). *Latent curve models: A structural equation perspective*. Hoboken, NJ: Wiley-Interscience.

Boscolo, P., & Hidi, S. (2007). The multiple meanings of motivation to write. In S. Hidi & P. Boscolo (Eds.), *Writing and motivation* (pp. 1-14). Amsterdam: Elsevier.

Bourdin, B., & Fayol, M. (1994). Is written language production more difficult than oral language production? A working memory approach. *International Journal of Psychology, 29*, 591-620. doi: 10.1080/00207599408248175

Bourdin, B., & Fayol, M. (2000). Is graphic activity cognitively costly? A developmental approach. *Reading and Writing: An Interdisciplinary Journal, 13*, 183-196. doi: 10.1023/A:1026458102685

Bruning, R. H., Dempsey, M., Kauffman, D. F., McKim, C., & Zumbrunn, S. (2013). Examining dimensions of self-efficacy for writing. *Journal of Educational Psychology, 105*, 25-38. doi: 10.1037/a0029692

Bruning, R. H., & Horn, C. (2000). Developing motivation to write. *Educational Psychologist, 35*, 25-37. doi: 10.1207/S15326985EP3501_4

Brunstein, J. C., & Glaser, C. (2011). Testing path-analytic mediation model of how self-regulated writing strategies improve fourth graders' composition skills: A randomized controlled trial. *Journal of Educational Psychology, 103*, 922-938. doi: 10.1037/a0024622

Burnette, J. L., O'Boyle, E. H., VanEpps, E. M., Pollack, J. M., & Finkel, E. J. (2013). Mind-sets matter: A meta-analytic review of implicit theories and self-regulation. *Psychological Bulletin, 139*, 655-701. doi: 10.1037/a0029531

Butterfield, E. C., Hacker, D. J., & Albertson, L. R. (1996). Environmental, cognitive, and metacognitive influences on text revision: Assessing the evidence. *Educational Psychology Review, 8*, 239-297. doi: 10.1007/BF01464075

Butterfield, E. C., Hacker, D. J., & Plumb, C. (1994). Topic knowledge, linguistic knowledge, and revision skill as determinants of text revision. In E. C. Butterfield (Ed.), *Children's writing: Toward a process theory of the development of skilled writing* (Vol. 2, pp. 83-141). Greenwhich, Connecticut: JAI Press.

Byrne, B. M. (2010). *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (2nd ed.). New York, NY: Routledge.

Carroll, J. B. (1964). *Language and thought*. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Carvalhais, L., & Castro, S. L. (2014). *Lexicality, complexity, and lenght effects on the development of Portuguese spelling*. Manuscript in preparation.

Carvalho, J. B. (2002). Developing audience awareness in writing. *Journal of Research in Reading, 25*, 271-282. doi: 10.1111/1467-9817.00175

Chanquoy, L. (2001). How to make it easier for children to revise their writing: A study of text revision from 3rd to 5th grades. *British Journal of Educational Psychology, 71*, 15-41. doi: 10.1348/000709901158370

Chanquoy, L. (2009). Revision processes. In R. Beard, D. Myhill, J. Riley & M. Nystrand (Eds.), *The Sage handbook of writing development* (pp. 80-97). London: Sage.

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14*, 464-504. doi: 10.1080/10705510701301834

Chenoweth, N. A., & Hayes, J. R. (2001). Fluency in writing: Generating text in L1 and L2. *Written Communication, 18*, 80-98. doi: 10.1177/0741088301018001004

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*, 233-255. doi: 10.1207/S15328007SEM0902_5

Chi, M. T. H., & VanLehn, K. A. (2012). Seeing deep structure from the interactions of surface features. *Educational Psychologist, 47*, 177-188. doi: 10.1080/00461520.2012.695709

Christensen, C. A. (2004). Relationship between orthographic-motor integration and computer use for the production of creative and well-structured written text. *British Journal of Educational Psychology, 74*, 551-564. doi: 10.1348/0007099042376373

Connelly, V., & Barnett, A. L. (2009). Introduction: Teaching and learning writing. *British Journal of Educational Psychology Monograph Series, II*(6), 1-4. doi: 10.1348/978185409X421110

Connelly, V., Gee, D., & Walsh, E. (2007). A comparison of keyboarded and handwritten compositions and the relationship with transcription speed. *British Journal of Educational Psychology, 77*, 479-492. doi: 10.1348/000709906X116768

De La Paz, S., & Graham, S. (1995). Dictation: Applications to writing for students with learning disabilities. In T. Scruggs & M. Mastropieri (Eds.), *Advances in learning and behavioral disorders* (Vol. 9, pp. 227-247). Greenwich, CT: JAI Press.

De La Paz, S., & Graham, S. (2002). Explicitly teaching strategies, skills, and knowledge: Writing instruction in middle school classrooms. *Journal of Educational Psychology, 94*, 687-698. doi: 10.1037//0022-0663.94.4.687

De La Paz, S., Swanson, H. L., & Graham, S. (1998). The contribution of executive control to the revising by students with writing and learning difficulties. *Journal of Educational Psychology, 90*, 448-460. doi: 10.1037/0022-0663.90.3.448

Donohoe, C., Topping, K., & Hannah, E. (2013). The impact of an online intervention (Brainology) on the mindset and resiliency of secondary school pupils: A preliminary mixed methods study. *Educational Psychology: An International Journal of Experimental Educational Psychology, 32*, 641-655. doi: 10.1080/01443410.2012.675646

Doron, J., Stephan, Y., Boiché, J., & Le Scanff, C. (2009). Coping with examinations: Exploring relationships between students' coping strategies, implicit theories of ability, and perceived control. *British Journal of Educational Psychology, 79*, 515-528. doi: 10.1348/978185409X402580

Duncan, T. E., Duncan, S. C., & Strycker, L. A. (2006). *An introduction to latent variable growth curve modeling: Concepts, issues, and application*. Mahwah, NJ: Laurence Erlbaum Associates.

Dweck, C. S. (1986). Motivational processes affecting learning. *American Psychologist, 41*, 1040-1048. doi: 10.1037/0003-066X.41.10.1040

Dweck, C. S. (1999). *Self-theories: Their role in motivation, personality, and development*. Philadelphia, PA: Psychology Press.

Dweck, C. S., Chiu, C., & Hong, Y. (1995). Implicit theories and their role in judgements and reactions: A world from two perspectives. *Psychological Inquiry, 6*, 267-285. doi: 10.1207/s15327965pli0604_1

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*, 256-273. doi: 10.1037/0033-295X.95.2.256

Englert, C. S., Raphael, T. E., Fear, K. L., & Anderson, L. M. (1988). Students' metacognitive knowledge about how to write informational texts. *Learning Disability Quarterly, 11*, 18-46. doi: 10.2307/1511035

Faria, L. (2003). Escala de concepções pessoais de inteligência (ECPI). In M. M. Gonçalves, M. R. Simões, L. S. Almeida & C. Machado (Eds.), *Avaliação psicológica: Instrumentos validados para a populaçãp portuguesa* (pp. 131-144). Coimbra: Quarteto Editora.

Faria, L. (2006). Escala de concepções pessoais de inteligênca (ECPI): Novos estudos. In M. M. Gonçalves, M. R. Simões, L. S. Almeida & C. Machado (Eds.), *Avaliação psicológica: Instrumentos validados para a população portuguesa* (pp. 121-133). Coimbra: Quarteto Editora.

Favart, M. (2005). Les marques de cohésion: Leur rôle fonctionnel dans l'acquisition de la production écrite de texte. *Psychologie Française, 50*, 305-322. doi: 10.1016/j.psfr.2005.05.006

Fayol, M. (1999). From on-line management problems to strategies in written composition. In M. Torrance & G. Jeffery (Eds.), *The cognitive demands of writing: Processing capacity and working memory effects in text production* (pp. 13-23). Amsterdam: Amsterdam University Press.

Fidalgo, R., Torrance, M., & García, J.-N. (2008). The long-term effects of strategy-focussed writing instruction for grade six students. *Contemporary Educational Psychology, 33*, 672-693. doi: 10.1016/j.cedpsych.2007.09.001

Fitzgerald, J. (1987). Research on revision in writing. *Review of Educational Research, 57*, 481-506. doi: 10.3102/00346543057004481

Fitzgerald, J., & Markham, L. R. (1987). Teaching children about revision in writing. *Cognition and Instruction, 4*, 3-24. doi: 10.1207/s1532690xci0401_1

Flower, L., & Hayes, J. R. (1980). The dynamics of composing: Making plans and juggling constraints. In L. W. Greeg & E. R. Steinberg (Eds.), *Cognitive processes in writing* (pp. 31-49). Hillsdale, NJ: Lawrence Erlbaum Associates.

Flower, L., Hayes, J. R., Carey, L., Schriver, L., & Stratman, J. (1986). Detection, diagnosis, and the strategies of revision. *College Composition and Communication, 37*, 16-55. doi: 10.2307/357381

Friend, R. (2001). Effects of strategy instruction on summary writing of college students. *Contemporary Educational Psychology, 26*, 3-24. doi: 10.1006/ceps.1999.1022

Fundação Francisco Manuel dos Santos. (2012). *PORDATA, Base de dados Portugal contemporâneo* [PORDATA, Contemporary Portugal Data- base]. Retrieved from http://www.pordata.pt/

Garner, R., & McCaleb, J. L. (1985). Effects of text manipulations on quality of written summaries. *Contemporary Educational Psychology, 10*, 139-149. doi: 10.1016/0361-476X(85)90014-1

Gelati, C. (2012). Female superiority and gender similarity effects and interest factors in writing. In V. W. Berninger (Ed.), *Past, present, and future contributions of cognitive writing research to cognitive psychology* (pp. 153-174). New York, NY: Psychology Press.

Glaser, C., & Brunstein, J. C. (2007). Improving fourth-grade students' composition skills: Effects of strategy instruction and self-regulation procedures. *Journal of Educational Psychology, 99*, 297-310. doi: 10.1037/0022-0663.99.2.297

Good, C., Aronson, J., & Inzlicht, M. (2003). Improving adolescents' standardized test performance: An intervention to reduce the effects of stereotype threat. *Applied Developmental Psychology, 24*, 645-662. doi: 10.1016/j.appdev.2003.09.002

Grabowski, J. (2010). Speaking, writing, and memory span in children: Output modality affects cognitive performance. *International Journal of Psychology, 45*, 28-39. doi: 10.1080/00207590902914051

Graham, S. (1990). The role of production factors in learning disabled students' compositions. *Journal of Educational Psychology, 82*, 781-791. doi: 10.1037//0022-0663.82.4.781

Graham, S. (1997). Executive control in the revising of students with learning and writing difficulties. *Journal of Educational Psychology, 89*, 223-234. doi: 10.1037/0022-0663.89.2.223

Graham, S. (2006a). Strategy instruction and the teaching of writing. In C. A. MacArthur, S. Graham & J. Fitzgerald (Eds.), *Handbook of writing research* (pp. 187-207). New York, NY: The Guilford Press.

Graham, S. (2006b). Writing. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (pp. 457-478). Mahwah, NJ: Erlbaum.

Graham, S., Berninger, V. W., Abbott, R. D., Abbott, S. P., & Whitaker, D. (1997). Role of mechanics in composing of elementary school students: A new methodological approach. *Journal of Educational Psychology, 89*, 170-182. doi: 10.1037/0022-0663.89.1.170

Graham, S., Gillespie, A., & McKeown, D. (2012). Writing: Importance, development, and instruction. *Reading and Writing: An Interdisciplinary Journal*(Advanced online publication). doi: 10.1007/s11145-012-9395-2

Graham, S., & Harris, K. R. (2000). The role of self-regulation and transcription skills in writing and writing development. *Educational Psychologist, 35*, 3-12. doi: 10.1207/S15326985EP3501_2

Graham, S., & Harris, K. R. (2003). Students with learning disabilities and the process of writing: A meta-analysis of SRSD studies. In H. L. Swanson, K. R. Harris & S. Graham (Eds.), *Handbook of learning disabilities* (pp. 383-402). New York, NY: The Guilford Press.

Graham, S., & Harris, K. R. (2007). Best practices in teaching planning. In S. Graham, C. A. MacArthur & J. Fitzgerald (Eds.), *Best practices in writing instruction* (pp. 119-140). New York, NY: The Guilford Press.

Graham, S., & Harris, K. R. (2009). Evidence-based writing practices: Drawing recommendations from multiple sources. *British Journal of Educational Psychology Monograph Series, II*(6), 95-111. doi: 10.1348/000709909X421928

Graham, S., Harris, K. R., & Fink-Chorzempa, B. (2002). Contribution of spelling instruction to the spelling, writing and reading of poor spellers. *Journal of Educational Psychology, 94*, 669-686. doi: 10.1037//0022-0663.94.4.669

Graham, S., Harris, K. R., MacArthur, C. A., & Schwartz, S. S. (1991). Writing and writing instruction for students with learning disabilities: Review of a research program. *Learning Disability Quarterly, 14*, 89-114. doi: 10.2307/1510517

Graham, S., Harris, K. R., & Mason, L. H. (2005). Improving the writing performance, knowledge, and self-efficacy of struggling young writers: The effects of self-regulated strategy development. *Contemporary Educational Psychology, 30*, 207-241. doi: 10.1016/j.cedpsych.2004.08.001

Graham, S., & Hebert, M. (2010). *Writing to read: Evidence for how writing can improve reading. A Carnegie Corporation Time to Act Report.* . Washington, DC: Alliance for Excellent Education.

Graham, S., McKeown, D., Kiuhara, S., & Harris, K. R. (2012). A meta-analysis of writing instruction for students in the elementary grades. *Journal of Educational Psychology, 104*, 879-896. doi: 10.1037/a0029185

Graham, S., & Perin, D. (2007). A meta-analysis of writing instruction for adolescent students. *Journal of Educational Psychology, 99*, 445-476. doi: 10.1037/0022-0663.99.3.445

Graham, S., Schwartz, S. S., & MacArthur, C. A. (1993). Knowledge of writing and the composition process, attitude toward writing, and self-efficacy for students with and without learning disabilities. *Journal of Learning Disabilities, 26*, 237-249. doi: 10.1177/002221949302600404

Grant, H., & Dweck, C. S. (2003). Clarifying achievement goals and their impact. *Journal of Personality and Social Psychology, 85*, 541-553. doi: 10.1037/0022-3514.85.3.541

Hacker, D. J. (1994). Comprehension monitoring as a writing process. In E. C. Butterfield (Ed.), *Children's writing: Toward a process theory of the development of skilled writing* (Vol. 2, pp. 143-172). Greenwhich, Connecticut: JAI Press.

Hacker, D. J., Plumb, C., Butterfield, E. C., Quathamer, D., & Heineken, E. (1994). Text revision: Detection and correction of errors. *Journal of Educational Psychology, 86*, 65-78. doi: 10.1037//0022-0663.86.1.65

Harris, K. R., & Graham, S. (1996). *Making the writing process work: Strategies for composition and self-regulation*. Cambridge, MA: Brookline.

Harris, K. R., & Graham, S. (2009). Self-regulated strategy development in writing: Premises, evolution, and the future. *British Journal of Educational Psychology Monograph Series, II*(6), 113-135. doi: 10.1348/978185409X422542

Harris, K. R., & Graham, S. (2013). "An adjective is a word hanging down from a noun": Learning to write and students with learning disabilities. *Annals of Dyslexia, 63*, 65-79.

Harris, K. R., Graham, S., Brindle, M., & Sandmel, K. N. (2009). Metacognition and children's writing. In D. J. Hacker, J. Dunlosky & A. C. Graesser (Eds.), *Handbook of metacognition in education* (pp. 131-153). Mahwah, NJ: Erlbaum.

Harris, K. R., Graham, S., & Mason, L. H. (2006). Improving the writing, knowledge, and motivation of struggling young writers: Effects of self-regulated strategy development with and without peer support. *American Educational Research Journal, 43*, 295-340. doi: 10.3102/00028312043002295

Harris, K. R., Graham, S., Mason, L. H., & Friedlander, B. (2008). *Powerful writing strategies for all students* Baltimore: Brookes.

Harris, K. R., Santangelo, T., & Graham, S. (2010). Metacognition and strategies instruction in writing. In H. S. Waters & W. Schneider (Eds.), *Metacognition, strategy use, and instruction* (pp. 226-256). New York, NY: The Guilford Press.

Hayes, J. R. (1996). A new framework for understanding cognition and affect in writing. In C. M. Levy & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences, and applications* (pp. 1-27). Mahwah, NJ: Lawrence Erlbaum Associates.

Hayes, J. R. (2004). What triggers revision? In L. Allal, L. Chanquoy & P. Largy (Eds.), *Revision: Cognitive and instructional processes*. Dordrecht: Kluwer Academic Publishers.

Hayes, J. R. (2012). Evidence from language bursts, revision, and transcription for translation and its relation to other writing processes. In M. Fayol, D. Alamargot & V. W. Berninger (Eds.), *Translation of thought to written text while composing: Advancing theory, knowledge, research, methods, tools, and applications* (pp. 15-25). New York, NY: Psychology Press.

Hayes, J. R., & Berninger, V. W. (2010). Relationships between idea generation and transcription: How the act of writing shapes what children write. In C. Bazerman, R. Krut, K. Lunsford, S. Mcleod, S. Null, L. A. Rogers & A. Stansell (Eds.), *Traditions of writing research*. New York, NY: Taylor & Francis/Routledge.

Hayes, J. R., & Flower, L. (1980). Identifying the organization of writing processes. In L. W. Gregg & E. R. Steinberg (Eds.), *Cognitive processes in writing* (pp. 3-29). Hillsdale, NJ: Lawrence Erlbaum Associates.

Hayes, J. R., & Flower, L. (1986). Writing research and the writer. *American Psychologist, 41*, 1106-1113. doi: 10.1037/0003-066X.41.10.1106

Hayes, J. R., & Nash, J. G. (1996). On the nature of planning in writing. In C. M. Levy & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences, and applications* (pp. 29-55). Mahwah, NJ: Lawrence Erlbaum Associates.

Hillocks, G. (1986). *Research on written composition*. Urbana, IL: ERIC Clearing-house on Reading and Communications Skills.

Hox, J. J. (2010). *Multilevel analysis: Techniques and applications* (2nd ed.). New York, NY: Routledge.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55. doi: 10.1080/10705519909540118

Jones, D., & Christensen, C. A. (1999). Relationship between automaticity in handwriting and students' ability to generate written text. *Journal of Educational Psychology, 91*, 44-49. doi: 10.1037//0022-0663.91.1.44

Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology, 80*, 437-447. doi: 10.1037/0022-0663.80.4.437

Juel, C., Griffith, P. L., & Gough, P. B. (1986). Acquisition of literacy: A longitudinal study of children in first and second grade. *Journal of Educational Psychology, 78*, 243-255. doi: 10.1037/0022-0663.78.4.243

Kellogg, R. T. (1988). Attentional overload and writing performance: Effects of rough draft and outline strategies. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 14*, 355-365. doi: 10.1037/0278-7393.14.2.355

Kellogg, R. T. (1996). A model of working memory in writing. In C. M. Levy & S. Ransdell (Eds.), *The science of writing* (pp. 57-71). Mahwah, NJ: Lawrence Erlbaum Associates.

Kellogg, R. T. (2008). Training writing skills: A cognitive developmental perspective. *Journal of Writing Research, 1*, 1-26.

Kellogg, R. T., & Whiteford, A. P. (2009). Training advanced writing skills: The case for deliberate practice. *Educational Psychologist, 44*, 250-266. doi: 10.1080/00461520903213600

Kieft, M., Rijlaarsdam, G., Galbraith, D., & van der Bergh, H. (2007). The effects of adapting a writing course to students' writing strategies. *British Journal of Educational Psychology, 77*, 565-578. doi: 10.1348/096317906X120231

Klassen, R. (2002a). Writing in early adolescence: A review of the role of self-efficacy beliefs. *Educational Psychology Review, 14*, 173-203. doi: 10.1023/A:1014626805572

Klassen, R. (2002b). A question of calibration: A review of the self-efficacy beliefs of students with learning disabilities. *Learning Disability Quarterly, 25*, 88-102. doi: 10.2307/1511276

Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York, NY: The Guilford Press.

Limpo, T., & Alves, R. A. (2013a). Modeling writing development: Contribution of transcription and self-regulation to Portuguese students' text generation quality. *Journal of Educational Psychology, 105*, 401-413. doi: 10.1037/a0031391

Limpo, T., & Alves, R. A. (2013b). Teaching planning or sentence-combining strategies: Effective SRSD interventions at different levels of written composition. *Contemporary Educational Psychology, 38*, 328-341. doi: 10.1016/j.cedpsych.2013.07.004

Limpo, T., Alves, R. A., & Fidalgo, R. (2013). Children's high-level writing skills: Development of planning and revising and their contribution to writing quality. *British Journal of Educational Psychology*, Advance online publication. doi: 10.1111/bjep.12020

Lin, S.-J. C., Monroe, B. W., & Troia, G. A. (2007). Development of writing knowledge in grades 2-8: A comparison of typically developing writers and their struggling peers. *Reading and Writing Quarterly, 23*, 207-230. doi: 10.1080/10573560701277542

Locke, E., Shaw, K., Saari, L., & Latham, G. (1981). Goal setting and task performance: 1969-1980. *Psychological Bulletin, 90*, 125-152.

MacArthur, C. A. (2012). Evaluation and revision. In V. W. Berninger (Ed.), *Past, present, and future contributions of cognitive writig research to cognitive psychology* (pp. 461-483). New York, NY: Psychology Press.

MacArthur, C. A., & Graham, S. (1987). Learning disabled students' composing under three methods of text production: Handwriting, word processing, and dictation. *The Journal of Special Education, 21*, 22-42. doi: 10.1177/002246698702100304

MacArthur, C. A., Graham, S., & Harris, K. R. (2004). Insights from instructional research on revision with struggling writers. In L. Allal, L. Chanquoy & P. Largy (Eds.), *Revision: Cognitive and instructional processes* (pp. 125-137). Amsterdam: Kluwer.

MacArthur, C. A., & Philippakos, Z. (2010). Instruction in a strategy for compare-contrast writing. *Council for Exceptional Children, 76*, 438-456.

Mace, F. C., Belfiore, P. J., & Hutchinson, J. M. (2001). Operant theory and research on self-regulation. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulated learning and academic achievement* (pp. 39-65). Mahwah, NJ: Lawrence Erlbaum Associates.

MacWhinney, B. (2000). *The Childes project: Tools for analyzing talk.* Mahwah, NJ: Lawrence Erlbaum Associates.

McCutchen, D. (1986). Domain Knowledge and linguistic knowledge in the development of writing ability. *Journal of Memory and Language, 25*, 431-444. doi: 10.1016/0749-596X(86)90036-7

McCutchen, D. (1988). "Functional automaticity" in children's writing: A problem of metacognitive control. *Written Communication, 5*, 306-324. doi: 10.1177/0741088388005003003

McCutchen, D. (1996). A capacity theory of writing: Working memory in composition. *Educational Psychology Review, 8*, 299-325. doi: 10.1007/BF01464076

McCutchen, D. (2006). Cognitive factors in the development of children's writing. In C. A. MacArthur, S. Graham & J. Fitzgerald (Eds.), *Handbook of writing research* (pp. 115-130). New York, NY: The Guilford Press.

McCutchen, D. (2011). From novice to expert: Implications of language skills and writing-relevant knowledge for memory during the development of writing skill. *Journal of Writing Research, 3*, 51-68.

McCutchen, D., Covill, A., Hoyne, S. H., & Mildes, K. (1994). Individual differences in writing: Implications of translating fluency. *Journal of Educational Psychology, 86*, 256-266.

McCutchen, D., Francis, M., & Kerr, S. (1997). Revising for meaning: Effects of knowledge and strategy. *Journal of Educational Psychology, 89*, 667-676. doi: 10.1037/0022-0663.89.4.667

Medwell, J., & Wray, D. (2008). Handwriting: A forgotten language skill? *Language and Education: An International Journal, 22*, 34-47. doi: 10.2167/le722.0

Meichenbaum, D. (1977). *Cognitive-behavior modification: An integrative approach*. New York, NY: Plenum Press.

Messick, S. (1995). Validity of psychological assessment: Validation of inferences from persons' responses and performances as scientific inquiry into score meaning. *American Psychologist, 50*, 741-749. doi: 10.1037/0003-066X.50.9.741

Molden, D. C., & Dweck, C. S. (2006). Finding "meaning" in psycology: A lay theories approach to self-regulation, social perception, and social development. *American Psychologist, 61*, 192-203. doi: 10.1037/0003-066X.61.3.192

Mueller, C. M., & Dweck, C. S. (1998). Praise for intelligence can undermine children's motivation and performance. *Journal of Personality and Social Psychology, 75*, 33-52. doi: 10.1037/0022-3514.75.1.33

Murakami, H. (2009). *What I talk about when I talk about running: A memoir*. New York, NY: Vintage International.

Nelson, R. O., & Hayes, S. C. (1981). Theoretical explanations for reactivity in self-monitoring. *Behavior Modification, 5*, 3-14. doi: 10.1177/014544558151001

Olinghouse, N. G., & Graham, S. (2009). The relationship between the discourse knowledge and the writing performance of elementary-grade students. *Journal of Educational Psychology, 101*, 37-50. doi: 10.1037/a0013248

Olive, T., Favart, M., Beauvais, C., & Beauvais, L. (2009). Children’s cognitive effort and fluency in writing: Effects of genre and of handwriting automatisation. *Learning and Instruction, 19*, 299-308. doi: 10.1016/j.learninstruc.2008.05.005

Olive, T., & Kellogg, R. T. (2002). Concurrent activation of high- and low-level production processes in written composition. *Memory & Cognition, 30*, 594-600. doi: 10.3758/BF03194960

Page-Voth, V., & Graham, S. (1999). Effects of goal setting and strategy use on the writing performance and self-efficacy of students with writing and learning problems. *Journal of Educational Psychology, 91*, 230-240.

Pajares, F. (2003). Self-efficacy beliefs, motivation, and achievement in writing: A review of the literature. *Reading and Writing Quarterly, 19*, 139-158. doi: 10.1080/10573560390143085

Pajares, F., Miller, M. D., & Johnson, M. J. (1999). Gender differences in writing self-beliefs of elementary school students. *Journal of Educational Psychology, 91*, 50-61. doi: 10.1037//0022-0663.91.1.50

Pajares, F., & Valiante, G. (1997). Influence of self-efficacy on elementary students' writing. *The Journal of Educational Research, 90*, 353-360. doi: 10.1080/00220671.1997.10544593

Pajares, F., & Valiante, G. (1999). Grade level and gender differences in the writing self-beliefs of middle school students. *Contemporary Educational Psychology, 24*, 390-405. doi: 10.1006/ceps.1998.0995

Pajares, F., Valiante, G., & Cheong, Y. F. (2007). Writing self-efficacy and its relation to gender, writing motivation and writing competence: A developmental perspective. In S. Hidi & P. Boscolo (Eds.), *Writing and motivation* (pp. 141-159). Amsterdam: Elsevier.

Palmquist, M., & Young, R. (1992). The notion of giftedness and student expectations about writing. *Written Communication, 9*, 137-168. doi: 10.1177/0741088392009001004

Perkins, D. N., & Salomon, G. (2012). Knowledge to go: A motivational and dispositional view of transfer. *Educational Psychologist, 47*, 248-258. doi: 10.1080/00461520.2012.693354

Pressley, M., & Harris, K. R. (2006). Cognitive strategies instruction: From basic research to classroom instruction. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (pp. 265-286). New York: Macmillan.

Rankin, J. L., & Reid, R. (1995). The SM rap - Or, here's the rap on self-monitoring. *Intervention in school and clinic, 30*, 181-188. doi: 10.1177/105345129503000309

Reece, J., & Cumming, G. (1996). Evaluating speech-based composition methods: Planning, dictation, and the listening word processor. In C. M. Levy & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences, and applications* (pp. 361-380). Mahwah, NJ: Lawrence Erlbaum Associates.

Reis, C., Dias, A. P., Cabral, A. T., Silva, E., Viegas, F., Bastos, G., . . . Pinto, M. O. (2009). *Programas de português do ensino básico*. Lisboa: Ministério da Educação.

Rijlaarsdam, G., Braaksma, M., Couzijn, M., Janssen, T., Kieft, M., Broekkamp, H., & Van den Bergh, H. (2005). Psychology and the teaching of writing in 8000 and some words. *British Journal of Educational Psychology Monograph Series, II*(3), 127-153. doi: 10.1348/000709905X62156

Rijlaarsdam, G., & Van den Bergh, H. (2006). Writing process theory: A functional dynamic approach. In C. A. MacArthur, S. Graham & J. Fitzgerald (Eds.), *Handbook of writing research* (pp. 41-53). New York, NY: The Guilford Press.

Robins, R. W., & Pals, J. L. (2002). Implicit self-theories in the academic domain: Implications for goal orientation, attributions, affect, and self-esteem change. *Self and Identity, 1*, 313-336. doi: 10.1080/1529886029010680 5

Rogers, L. A., & Graham, S. (2008). A meta-analysis of single subject design writing intervention research. *Journal of Educational Psychology, 100*, 879-906. doi: 10.1037/0022-0663.100.4.879

Saddler, B. (2007). Improving sentence construction skills through sentence-combining practice. In S. Graham, C. A. MacArthur & J. Fitzgerald (Eds.), *Best practices in writing instruction*. New York, NY: The Guilford Press.

Saddler, B., & Asaro, K. (2008). Beyond noun-verb: The use of sentence combining to improve sentence writing ability. *Insights on Learning Disabilities, 5*, 41-50.

Saddler, B., Behforooz, B., & Asaro, K. (2008). The effects of sentence-combining instruction on the writing of fourth-grade students with writing difficulties. *The Journal of Special Education, 42*, 79-90. doi: 10.1177/0022466907310371

Saddler, B., & Graham, S. (2005). The effects of peer-assisted sentence-combining instruction on the writing performance of more and less skilled young writers. *Journal of Educational Psychology, 97*, 43-54. doi: 10.1037/0022-0663.97.1.43

Sawyer, R. J., Graham, S., & Harris, K. R. (1992). Direct teaching, strategy instruction, and strategy instruction with explicit self-regulation: Effects on the composition skills and self-efficacy of students with learning disabilities. *Journal of Educational Psychology, 84*, 340-352.

Scardamalia, M., & Bereiter, C. (1983). The development of evaluative, diagnostic and remedial capabilities in children's composing. In M. Martlew (Ed.), *The psychology of written language: Development and educational perspectives* (pp. 67-95). New York, NY: Wiley.

Scardamalia, M., Bereiter, C., & Goleman, H. (1982). The role of production factors in writing ability. In M. Nystrand (Ed.), *What writers know: The language, process, and structure of written discourse* (pp. 173-210). New York, NY: Academic Press.

Schunk, D. H. (2001). Social cognitive theory and self-regulated learning. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulated learning and academic achievement*. Mahwah, NJ: Lawrence Erlbaum Associates.

Schunk, D. H. (2003). Self-efficacy for reading and writing: Influence of modeling, goal setting, and self-evaluation. *Reading and Writing Quarterly, 19*, 159-172.

Schunk, D. H., & Ertmer, P. A. (2000). Self-regulation and academic learning: Self-efficacy enhancing interventions. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), *Self-regulation: Theory, research, and applications* (pp. 631-649). Orlando, FL: Academic Press.

Schunk, D. H., & Swartz, C. W. (1993). Goals and progress feedback: Effects on self-efficacy and writing achievement. *Contemporary Educational Psychology, 18*, 337-354.

Schunk, D. H., & Zimmerman, B. J. (1997). Social origins of self-regulatory competence. *Educational Psychologist, 32*, 195-208.

Shell, D. F., Murphy, C. C., & Bruning, R. H. (1989). Self-efficacy and outcome expectancy mechanisms in reading and writing achievement. *Journal of Educational Psychology, 81*, 91-100. doi: 10.1037/0022-0663.81.1.91

Shepard, L. A. (2000). The role of assessment in a learning culture. *Educational Researcher, 29*, 4-14. doi: 10.3102/0013189X029007004

Stein, N. L., & Trabasso, T. (1982). What's in a story? An approach to comprehension and instruction. In R. Glaser (Ed.), *Advances in instructional psychology* (Vol. 2, pp. 213-267). Hillsdale, NJ: Laurence Erlbaum Associates.

Strong, W. (1986). *Creative approaches to sentence combining*. Urbana, IL: ERIC Clearinghouse on Reading and Communication Skills and the National Council of Teachers of English.

Strong, W. (1996). *Writer's toolbox: A sentence-combining workshop*. New York, NY: McGraw-Hill.

Thompson, T., & Musket, S. (2005). Does priming for mastery goals improve the performance of students with an entity view of ability? *British Journal of Educational Psychology, 75*, 391-409. doi: 10.1348/000709904X22700

Torrance, M., Fidalgo, R., & García, J.-N. (2007). The teachability and effectiveness of cognitive self-regulation in sixth-grade writers. *Learning and Instruction, 17*, 265-285. doi: 10.1016/j.learninstruc.2007.02.003

Torrance, M., Thomas, G. V., & Robinson, E. J. (1999). Individual differences in the writing behaviour of undergraduate students. *British Journal of Educational Psychology, 69*, 189-199. doi: 10.1348/000709999157662

van der Bergh, H., & Rijkaarsdam, G. (1999). The dynamics of idea generation during writing: An on-line study. In M. Torrance & D. Galbraith (Eds.), *Knowing what to write: Conceptual processes in text production*. Amsterdam: Amsterdam University Press.

Vanderberg, R., & Swanson, H. L. (2007). Which components of working memory are important in the writing process? *Reading and Writing: An Interdisciplinary Journal, 20*, 721-752. doi: 10.1007/s11145-006-9046-6

Wagner, R. K., Puranik, C. S., Foorman, B., Foster, E., Wilson, L. G., Tschinkel, E., & Kantor, P. T. (2011). Modeling the development of written language. *Reading and Writing: An Interdisciplinary Journal, 24*, 203-220. doi: 10.1007/s11145-010-9266-7

Whitaker, D., Berninger, V. W., Johnston, J., & Swanson, H. L. (1994). Intraindividual differences in levels of language in intermediate grade writers: Implications for

the translating process. *Learning and Individual Differences, 6*, 107-130. doi: 10.1016/1041-6080(94)90016-7

White, M. J., & Bruning, R. H. (2005). Implicit writing beliefs and their relation to writing quality. *Contemporary Educational Psychology, 30*, 166-189. doi: 10.1016/j.cedpsych.2004.07.002

Willett, J. B. (1989). Some results on reliability for the longitudinal measurement of change: Implications for the design of studies of individual growth. *Educational and Psychological Measurement, 49*, 587-602. doi: 10.1177/001316448904900309

Winograd, P. N. (1983). Strategic difficulties in summarizing texts. *Reading Research Quarterly, 19*, 404-425. doi: 10.2307/747913

Wong, B. Y. L., Hoskyn, M., Jai, D., Ellis, P., & Watson, K. (2008). The comparative efficacy of two approaches to teaching sixth graders opinion essay writing. *Contemporary Educational Psychology, 33*, 757.784. doi: 10.1016/j.cedpsych.2007.12.004

Zeidner, M., Boekaerts, M., & Pintrich, P. R. (2000). Self-regulation: Directions and challenges for future research. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), *Self-regulation: Theory, research, and applications* (pp. 749-768). Orlando, FL: Academic Press.

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology, 81*, 329-339.

Zimmerman, B. J. (1995). Self-regulation involves more than metacognition: A social cognitive perspective. *Educational Psychologist, 30*, 217-221. doi: 10.1207/s15326985ep3004_8

Zimmerman, B. J. (2000). Attaining self-regulation: A social-cognitive perspective. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), *Self-regulation: Theory, research, and applications* (pp. 13-39). Orlando, FL: Academic Press.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice, 41*, 64-70.

Zimmerman, B. J. (2009). Goal setting: A key proactive source of academic self-regulation. In D. H. Schunk & B. J. Zimmerman (Eds.), *Motivation and self-*

regulated learning: Theory, research, and applications (pp. 267-295). New York, NY: Routledge.

Zimmerman, B. J. (2013). From cognitive modeling to self-regulation: A social cognitive career path. *Educational Psychologist, 48*, 135-147. doi: 10.1080/00461520.2013.794676

Zimmerman, B. J., & Kitsantas, A. (2002). Acquiring writing revision and self-regulatory skill through observation and emulation. *Journal of Educational Psychology, 94*, 660-668.

Zimmerman, B. J., & Martinez-Pons, M. (1990). Student differences in self-regulated learning: Relating grade, sex, and giftedness to self-efficacy and strategy use. *Journal of Educational Psychology, 82*, 51-59. doi: 10.1037/0022-0663.82.1.51

Zimmerman, B. J., & Risemberg, R. (1997). Becoming a self-regulated writer: A social cognitive perspective. *Contemporary Educational Psychology, 22*, 73-101. doi: 10.1006/ceps.1997.0919

Zumbrunn, S., & Bruning, R. (2013). Improving the writing and knowledge of emergent writers: The effects of self-regulated strategy development. *Reading and Writing: An Interdisciplinary Journal, 16*, 91-110. doi: 10.1007/s11145-012-9384-5

APPENDIX

Overview of the Instructional Procedures of each Lesson of the Intervention

Lesson 1 • Students set the goal for the program (viz., write good opinion essays) and discussed the importance of planning ahead of writing to achieve it. • Teachers told them that they were going to learn a strategy to make good plans. • Students committed to try hard to learn the strategy by signing a learning contract.
Lesson 2 • Teachers presented the CRÊS strategy and discussed the meaning of each letter. • Students were introduced to the self-monitoring sheet. They had to find and register the essay parts included, first, in an exemplar opinion essay and, then, in their own pre-test essays. • Students registered their pre-intervention performance by filling out their progress sheet (from this session on, they filled it out anytime they worked individually).
Lesson 3 • Teachers modelled how to plan an opinion essay with the CRÊS strategy. • The whole class discussed what the teachers had said to themselves. • Students came up with self-instructions for each of the three steps of the writing flowchart (viz., before writing, during writing, and after writing)
Lesson 4 • The whole class emulated the teachers' modelling to plan an opinion essay with CRÊS. • Students were asked to repeat the procedure as homework.
Lesson 5 • Students planned an opinion essay with CRÊS individually, but under teachers' guidance.
Lesson 6 • Teachers modelled how to use CRÊS to plan and write an opinion essay. • Students discussed what teachers had said to themselves and how it differed from Lesson 3. • Students came up with updated self-instructions for the writing flowchart.
Lesson 7 • The whole class emulated the teachers' modelling to plan and write an opinion essay with CRÊS. • Students were prompted to apply the writing and self-regulation strategies in different situations once per week (from this session on, they discussed each situation where they applied them)
Lesson 8 • Students planned and wrote an opinion essay with CRÊS individually, but under teachers' guidance.
Lesson 9 • Teachers grouped students facing similar difficulties and gave them individualized feedback. • Students generated a special self-instruction to overcome their main difficulty. • For homework, they planned and wrote an opinion essay with CRÊS, paying particular attention to the special self-instruction.
Lessons 10-11 • Students planned and wrote an opinion essay with CRÊS individually, with minimal support.
Lesson 12 • Students examined their progress sheet and discussed how the strategy and their effort helped them to write good opinion essays. • Teachers gave students "quality certificates" to stick on their learning contracts.

Note. CRÊS is a Portuguese mnemonic for the key parts of an opinion essay: tell what you believe, give 3 or more reasons, explain each reason, and wrap it up.